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Distr.
GENERAL

UNCTAD/COM/60*
12 April 1995

ENGLISH ONLY

UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

Proceedings of the Seminar on Capacity Building for Environmental Management in Asian/Pacific Mining

Jakarta, Indonesia, 6 to 8 September 1994

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*Re-issued for technical reasons.

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INTRODUCTION

The Seminar on Capacity Building for Environmental Management in Asian/Pacific Mining was held in Jakarta from 6 to 8 September, 1994. The seminar was organized by the United Nations Conference on Trade and Development (UNCTAD), the Ministry of Mines and Energy of Indonesia and the Indonesian Mining Association. It took place within the framework of an inter-country technical assistance programme entitled "Strengthening Capacities for Growth through Trade and Investment", funded by the United Nations Development Programme.

The objectives of the seminar were to review legislation and practices concerning environmental management in mining in Asian and Pacific countries, exchange views and experiences and identify possibilities of cooperation between the countries in the region, including technical assistance needs. It was aimed at senior government officials responsible for the formulation and implementation of environmental regulations and guidelines for the mining industry as well as executives of public and private companies operating in the mineral sector. The 55 participants included representatives from thirteen countries (see the annex for a list of participants). In order to facilitate the discussions, the UNCTAD secretariat made available to participants a background paper entitled "Environmental legislation for the mining and metals industries in Asia" (UNCTAD/COM/40), prepared by Mr. Anselmo C. Abungan, Attorney, Department of Environment and Natural Resources of the Philippines.

The seminar was divided into four substantive sessions, dealing respectively with Approaches to Regulation, Environmental Impact Assessment, Rehabilitation of Mining Sites and Monitoring and Enforcement. The final session was devoted to formulating conclusions and recommendations. For the purposes of these proceedings, presentations made at the seminar have been lightly edited with a view to reduce the overall length of the document. Substantive and linguistic editing was carried out by the UNCTAD secretariat assisted by Mr. Sean Wootton, a consultant to UNCTAD.

OPENING SESSION

Introductory remarks

Olle Östensson
United Nations Conference on Trade and Development

I should like to welcome you all to this seminar on Capacity Building for Environmental Management in Asian/Pacific Mining. The seminar is organized within the framework of a broad UNDP financed program on trade and investment in the Asian/Pacific region. A key objective of that program is to strengthen the institutional infrastructure dealing with trade and investment in the countries concerned, an objective which is, of course, also highly relevant to this seminar.

Environmental issues are increasingly becoming intertwined with trade and investment questions. Indeed, environmental aspects will certainly have to be taken into account both by governments and by companies in every consideration of trade and investment. It is clearly important, therefore, that all the interested parties are aware of the issues and that they have the knowledge necessary to allow them both to enter into constructive negotiations and arrive at well-considered and adequate decisions.

In the view of UNCTAD, exchange of information on approaches to, and details of, environmental regulation between countries is one of the most efficient ways to ensure that solutions to problems facing the countries are reached. While regulatory systems cannot and should not be standardized, and while every country has to find the approach that is best suited to its circumstances, knowing what your neighbours are doing can provide you with good ideas.

It is for this reason that UNCTAD chose to take the initiative for this seminar. The reasons for making the seminar a regional Asian/Pacific one are equally clear. Many countries in this region are at present faced with a surge in investors' interest in mining. Favourable geological conditions are certainly one of the reasons for this. The extremely rapid economic growth and the economic and political transformation of many countries in the region are other important reasons, since they offer not only new investment opportunities but also new markets. At the same time, many, possibly most of the countries in the region are in the process of reforming not only their environmental legislation, but also their mining laws and foreign investment codes. There is thus a unique opportunity to adopt a comprehensive and integrated approach to all the issues that are located in the intersection of trade, investment, mining and environmental considerations. Hence, the choice of region.

UNCTAD was lucky enough to find very good partners for this exercise in the Ministry of Energy and Mines of Indonesia and the Indonesian Mining Association. As all of you know, Indonesia has an extremely dynamic mineral sector. The country is usually at the top of the lists drawn up by investors of countries with good prospects for mineral investment. It is also a country where domestic enterprises are playing an increasingly important role in the mineral sector and where government and enterprises are able to work out solutions in a spirit of constructive negotiation. Indonesia also has an ambitious approach to environmental policy, reflecting the high priority given by its people and its government to the quality of the environment. We are, therefore, very happy to cooperate with the Ministry of Energy and Mines of Indonesia and the Indonesian Mining Association in organizing this seminar.

Opening ceremony statement

Fritz H. Loebus
United Nations Development Programme
Jakarta, Indonesia

It is indeed a pleasure for us in the UNDP to participate today in the opening session of this important seminar. The presence here of delegations from many Asian countries and from a number of international institutions is an indication of the great importance attached to the subject of environmental management in the mining sector in the Asia and Pacific region, which is now the largest trading region in the world.

I wish to extend our gratitude to the Government of Indonesia for hosting this seminar and also congratulate the organizers of the meeting, under the leadership of Mr. Kuntoro Mangunsubroto, for the excellent arrangements made in convening and organizing this most timely and useful seminar, the topic of which is very relevant to the present global situation, particularly in the context of sustainable development which is being vigorously promoted around the globe. Furthermore, it is appropriate and not surprising that this meeting is being held in Jakarta, as the Government of Indonesia attaches great importance to the issues related to environmental management.

We are all witnessing the momentous changes that are taking place around the world these days, and the extraordinary pace at which these events are unfolding. These developments provide both challenges and unique opportunities for increased co-operation amongst all countries. More countries become aware of relatively new issues, such as trade and the environment, intellectual property rights, and the labour market. The conclusion of the Uruguay Round is important not only for the tangible trade liberalization it promises, but also for the signal that further regional gains can now be made within a framework of multilateralism and better management of natural resources, and their implications for international competitiveness. This will require a better understanding of the relationship between trade and environment for the promotion of sustainable development.

UNDP sees it as a great privilege to have been closely associated with efforts made by countries in this region, which presently contribute half of the world's exports, for improving their capacity in environmental management, particularly in the mining sector. I wish to assure you that we in the UNDP will continue to support, within the limits of our resources, the further enhancement and fulfilment of the acknowledged substantial potential for improved natural resource base management in the region. Within the next few days, this seminar will no doubt help to broaden our understanding and perspective of the policy issues related to trade and environment.

This workshop represents one of many activities within the framework of the UNDP-funded inter-country technical assistance programme, entitled **"Strengthening Capacities for Growth through Trade and Investment"**. This five-year programme, which was started in October 1993, aims at assisting the developing countries in the region to accelerate their integration into an increasingly inter-dependent world-wide economic and trading system, through policy reform and institutional development, both at regional and national levels. It has six principal objectives which are mutually supportive, namely:

1. To strengthen institutional capacities for participation in the multilateral trading system in the aftermath of the Uruguay Round;

2. To build up national capacities for efficient exploitation of business opportunities;
3. To facilitate the establishment of networks to support trade-related institutions;
4. To develop and implement policies and strategies for export expansion by small and medium enterprises;
5. To assist in the modernization of intellectual property systems; and
6. To strengthen the investment environment in order to attract the desired flow of foreign direct investment.

At the national level, UNDP and the United Nations system also assist the Government of Indonesia in strengthening its environmental management in the mining sector. As requested by the Government, a two-week mission was fielded at the end of October 1993 to provide technical assistance in the Development and Improvement of the Environmental Policy and Regulation Program for Metalliferous Mines. This mission was supported by the Department for Development Support and Management Services (DDSMS) of the United Nations, and its findings and recommendations were presented to the potential donors for further funding.

Ladies and gentlemen, let me close my remarks by wishing you, all of the participants gathered here today, success in your very important deliberations. The views and cumulative experiences of the countries you all represent are testimony to the enormous wealth and power of the developing countries of the region, and I am confident that the cross-fertilization of ideas and experiences, as well as sharing of resources, will no doubt contribute in a significant way to the full realization of the economic and social development of each of the participating countries. Last but not least, I would like to extend our appreciation to our colleagues from UNCTAD and ESCAP, and to other resource persons who have been instrumental in making this gathering a success.

Keynote speech

Ridwan Mahmud
Ministry of Mines and Energy
Indonesia

Distinguished guests, ladies and gentlemen,

It gives me great pleasure to extend my warmest welcome to our honourable and distinguished guests, representatives and speakers from foreign countries as well as our domestic participants. We would like also to express our sincere gratitude to the United Nations Conference on Trade and Development, the Indonesian Mining Association and P.T. Aneka Tambang who initiated and sponsored this seminar. We are indeed proud to host you here for this invaluable seminar to discuss or even to formulate policies and strategies which support Asian/ Pacific mining development.

Environmental concerns are being roused in developing countries. In Asian/Pacific countries the concern is growing simultaneously with the economic development of the region. This is demonstrated by the number of environmental regulations that have been recently enacted in many of the countries of the region. Mining operations have the potential like any other human activity to cause environmental degradation. It therefore becomes essential to assess the effects of present, planned and future mining operations in the context of environment and development issues.

Government institutions play an important role. They supply the legislation and regulations that provide a framework for the implementation of environmental policies. Their role is critical to the development of mining activities which in turn have inherent environmental implications.

As some of you may be aware, Indonesia is now entering its second long term development phase that is predicted to create a market for mining products since the supply of minerals and metalliferous ores as raw materials needs to keep pace with the growth of domestic industry. Minerals production will also meet Indonesia's domestic energy needs: support and improve national export earnings: increase the state income: develop remote areas as part of regional development programmes and provide business and employment opportunities for our citizens. In addition, since Indonesia is situated within the world's most dynamic economic growth region, it is likely that the demand for non-fuel minerals and coal to fulfil the needs of our neighbouring countries will increase substantially.

Despite the mining industry's favourable progress towards environmental protection, crucial policy issues demand a balance between actions which support the continued economic growth of Indonesia and environmental quality in order to achieve sustainable development. Observing sound, efficient mining practices while maintaining or improving environmental quality is essential to achieve a proper balance in the economic growth in Indonesia.

Current environmental policy in mining is based on the regulation enacted by the Ministry of Mines and Energy in 1977. Pursuant to it, several decrees were issued by the Direktorat Jenderal Pertambangan Umum (Directorate General of Mines) in 1978, regulating environmental impacts of surface mining, underground mining, mineral treatment plants, and dredging activities. Compared to the environmental protection standards prescribed in the national environmental policy that was enacted in 1982 as the Basic Provision for Management of the Living Environment Act (Act No.4/1982), the Ministry of Mining and Energy has already taken the lead in caring for the environment, but much remains to be done.

Environmental problems caused by mining remain and can still be seen clearly. Some companies can be seen as achieving a poor degree of compliance. Problems exist regarding land use conflicts, deviations from environmental standards, enforcement and the inadequate development of human resources. All of these problems must be tackled. Preventive measures to avoid environmental damage should be adequately and practically designed. Environmental awareness should be promoted through a comprehensive and integrated system of information transfer which disseminates information on regulatory issues and improves the proficiency of the people who are responsible for managing environmental problems at the mine sites. Enforcement capabilities also require improvement.

The degree of compliance in environmental management depends not only on the nature of the policy but also on the attitude of the company itself. It has been noted that mining companies with good environmental ethics or commitment have taken care of the environment with their best efforts regardless of the nature of the regulations. Their performance exceeds that which is required by law. Others are trying to hide their environmental problems, utilizing all avenues to avoid compliance. Lack of environmental awareness has been used as an excuse not to comply with regulations.

The Indonesian environmental education campaign should be intensified to promote environmental responsibility. Company policy makers are the main target as they play an important role in defining a company's priorities. Care should be taken to ensure that companies' operations do not degrade the environment. Some in the mining community should be ashamed of including avoided environmental costs as part of their profit component. The environmental education campaign will not only be aimed at the people responsible for environmental management but also at company employees and the community surrounding the mining area. This will establish a mechanism for citizens affected by a development in order to help them protect their environment. Necessary guidance should also be provided to local citizens and employees to give direction on how to proceed with environmental complaints.

Our experience shows that direct regulatory approaches are only effective when the government has adequate resources, access, and capability to monitor and enforce implementation. There is interest in incentive based mechanisms as an alternative method for encouraging the mining industry to comply with regulations. It is however noted that not all types of pollution can be addressed by such a system. Incentives may take the form of allowances, whether monetary, operational or regulatory, which permit less attractive mineral deposits to be mined or marginally profitably mines to increase their profit. All mining has a series of costs associated with it. These include lease and royalty costs; mining, milling, and other operating costs; labour costs; costs of regulation such as an EIA and/or permit; and the costs of complying with the various requirements that local, provincial, and central governments impose. These legitimate costs must either be paid at the time of mining or deferred until some later time. Low environmental standards defers the legitimate costs of reclamation and environmental protection until a time long after the mining is completed and the benefits forgotten. A compromise between providing incentives which defer legitimate costs, and rigid compliance with strict environmental design standards based on best available technology, may be provided through performance standards which are outcome based. Performance standards essentially tell companies what environmental outcomes are required and allow them to use their creativity fuelled by cost savings to meet the goals set. There are a number of "off the shelf" technologies which meet the requirements but they are not always the cheapest to use. Allowing companies to try different methods in order to achieve compliance develops new technology. Some very cost effective examples from America include reclaiming coal slurry impoundments using wetlands rather than covering the entire impoundment with four feet of non-acid producing material. Another cost saving method was provided by not constructing sediment ponds to trap sediment but using vegetated filter strips as an alternative. In both these cases the water quality standards were met or exceeded and substantial cost savings were realized by the companies. These are two ways to improve a mine's attractiveness and a company's profit without deferring the environmental costs until other development pressures require clean-up and/or the mining company is out of business and the costs fall upon the government and the public.

Environmental control standards which include environmental quality criteria, parameter and threshold limit values should also be reviewed and developed. Threshold values should be formulated together with the Office of the State Minister for Living Environment and Bapedal (the Agency for Environmental Impact Management) as well as other related government agencies. The level of technological development and the cost of the technology that meets the standard should also be considered, so that the enforcement of standards will not jeopardize the mining industry's development.

General performance standards should be set after determining the requirements of interested parties and applying the overall principles of national interest. This can only be achieved by the Government which not only understands the immediate economic development priorities of the nation but is also charged with overall responsibility for safeguarding the nation's natural resources, including the ecology and environment.

An economic instrument that deserves consideration is the reclamation guarantee fund or reclamation bond. In some cases, say for highly mechanized, large-scale production mining companies, it may be workable. We also have to consider that mining in Indonesia covers a wide range of activities. Small scale mining companies, people who try to make living by digging up industrial minerals, are colouring Indonesia's mining business. There are millions of them scattered through the archipelago and the environmental impacts of their activities cannot be overlooked. This is an important problem and the Indonesian Government is preparing comprehensive guidelines in an attempt to overcome these environmental problems.

In order to satisfy the many parties involved in successful environmental management, we have to consider establishing performance standards that are agreeable to the parties involved. Without standards, nobody knows the limits, thus creating uncertainty which could result in unnecessary costs to mining companies.

Indonesian society as well as the people in the Asian/Pacific area are more educated than in the past. They are now very wary of the destruction of their environment. In Indonesia, other industries have an unpleasant relationship with their surrounding communities because they have created an environmental nuisance. Mining companies should learn what happened in these cases and take measures to prevent it from taking place within the mining industry. Recently, the Indonesian government has taken the CEO of one mining company to court and he was punished for his carelessness towards the environment.

Planning should begin on an integrated mining environmental policy and regulatory framework to avoid shifting the problem to other sectors of development, where it exerts a different but equally damaging impact. To cope with the second long term development plan, the Ministry of Mines and Energy will review relevant legislation, decrees and regulations concerning control of the environmental impacts of mining activities. This will include designing a comprehensive environmental policy with clear goals, responsibilities, actions and targets. Policy and procedural aspects of the regulatory program should also be assessed to determine whether adequate legal authority exists and whether the technical guidance provided is sufficient for implementation of an effective and enforceable regulatory program.

Supporting facilities in terms of data on the best applicable and best available technology incorporating state of the art environmental control technology should also be developed to provide a service assisting in overcoming the potential environmental impact of a mining development. A waste minimization program is another strategy that should be incorporated into the regulatory review. Mining waste may be useful to other industries or local construction projects. An integrated database which incorporates the location, amount, nature, and characteristics of mining waste should be developed, providing comprehensive information to other sectors on this hidden potential of mining. A by-product of this environmental policy and strategy is the opportunity for the development of an environmental services business sector. Laboratory testing of compliance samples is to be undertaken by accredited or trustworthy ventures. Reclamation and revegetation projects are other areas that can be served by appropriate contractors, while the requirement of a reclamation bond can promote specific insurance schemes for mining.

Finally, to support policy and strategy and to be able to enforce and monitor the implementation of environmental management programmes, the human resources capability within the industry should be developed. This will require a training program for policy makers, mine inspectors, and employees who are responsible for environmental monitoring and management

Distinguished guests, ladies and gentlemen.
A seminar such as this is the ideal forum to share our experiences and our ideas. I hope we can learn from each others' successes and failures to gain the best possible results from this exchange. I hope you have a memorable stay in Jakarta, and I declare the seminar officially open.

SESSION I: APPROACHES TO REGULATION

An assessment of the environmental impact of the mineral and mining industry in Bangladesh

Syed Anowarul Huq
Petrobangla
Bangladesh

Protection and preservation of the environment has become one of the most important issues in the modern world. The Government of Bangladesh has recently increased its activity and interest in the protection and improvement of the environment and is pursuing a dynamic policy in this field. Environmental Quality Standards have been prepared, and there is a government body with specific responsibility for the environment. Programmes have been instituted for reviewing and improving policies and standards.

Wherever mankind exists, there will inevitably be some effect on the environment. As population levels increase, so the effect on the environment becomes multiplied. Bangladesh has one of the highest populations per square kilometre of land area in the world and the population continues to increase. Until now it has mainly been an agricultural country. High population levels in a relatively poor country has had an impact on the environment. Natural waste pollution is widespread. Wood is used for fuel which leads to severe deforestation. Land is over-utilised causing the relentless erosion of topsoil.

To minimise the impact of industrial developments it is current modern practice to predict the effects on the environment before the development is allowed to take place, so that appropriate measures may be taken to prevent unacceptable or irreversible damage. Such studies, or Environmental Impact Assessments, are now frequently made a prerequisite of any development permit and in the future it can be expected that EIA's will be a mandatory requirement before any industrial development.

An Environmental Impact Assessment will examine not only the effluent and emissions from the development and the means of limiting or eliminating these, but also the effect on water resources, flora, fauna, tidal movements in the coastal developments, land utilisation, noise levels, safety of both workers and the local community and, importantly, the socioeconomic effects upon the population. The benefits of a development must also be considered.

Damage and disruption to land are caused by the construction and presence of treatment plants and mining operations. These facilities may have a severe socioeconomic effect by depriving local populations of agricultural land, residential land, and reducing the land available food production. The development will generally require the construction of access roads which in themselves may be a major benefit and reduce an area's isolation. Some benefit may also be derived from the increased opportunity for employment. The balance of all these factors must be taken into consideration.

Mining and the exploitation of mineral resources is a growing industry in Bangladesh. Excavation of earth, the disposal of waste liquids and effluents are major environmental problems which must be considered. Dust from certain types of mining can be a major health hazard to the local population and must be controlled. The treatment or refining of minerals in the future may present the problems of disposing of toxic products and effluent. Depending on the nature of the geology in the mine area, subsidence may occur during or after mining operations. Restoration and the alternative utilisation of mining lands require consideration. Care is needed from the design phase on to prevent possible adverse environmental impacts from both underground and surface mining. This care is further augmented by enforcing mining rules and regulations and the relevant environmental quality standards once the operation has commenced.

So far, Bangladesh has discovered limestone, coal, peat clay, hard rock and silica sand. Of these, peat and clay are found at depths ranging from 0.5 to 1 metre. The output from the existing open-cut and fox-hole mining of outcrops is insufficient to meet the demand in the country. Because of the exhaustion of outcrop deposits, mining depth is gradually increasing, making open pit mining uneconomical.

In the past, mining in Bangladesh has been on a small scale, uncoordinated and unregulated. It has been opencast quarrying or excavation for limestone, sands and clay, or shallow drift mining for limited mineral deposits. Little attention has been paid to either the immediate or longer term effects on the operation's surroundings and the local community. Surplus and waste materials have been dumped indiscriminately and liquid effluent has been discharged into important rivers and water courses. Safety has been given little or no consideration. Workings have been abandoned once they have yielded their recoverable material. Open excavations have been left to fill with water which, during the drier seasons of the year, remains stagnant and provides a perfect breeding ground for mosquitoes. Frequent inspections are now being made to ensure the reclamation of open-cut mining areas.

It has been known for some time that there are extensive mineral deposits deep underground, the exploitation of which will require deep mining operations. In particular, large coal deposits exist in the northern part of the country at Barapukuria and hard stone deposits at Madhapara. Until now, little attempt has been made to exploit these deposits because of the high capital cost and the need for foreign expertise and investment. With the improved economic and political stability of the country, and the increasing demand for energy and indigenous construction material, the Government of Bangladesh has vigorously sponsored the development of projects for the exploitation of these deep deposits. These mining projects are now under-way. The country has recently entered into two contracts with foreign firms for development of underground coal and hard rock mines.

Of late, importance has also been attached to open-cut extraction of peat. Coal and peat will not only partially meet the local domestic demand, but they will also help supply fuel to the indigenous brick manufacturing industries which have been illegally using firewood as fuel. The increased supply of coal will supply energy to various sectors and will help to arrest deforestation.

Because of the lack of other sources of energy (natural gas is limited to the north west region of the country) it is intended that 70 per cent of the mined coal will be used for power generation in a thermal power station to be built adjacent to the coal mine.

This development immediately poses the classic questions:
-What are the beneficial effects?
-What are the detrimental effects?
-How can the detrimental effects be eliminated or mitigated?
-What is the balance?

The benefits of such a development are perhaps fairly obvious. The use of coal will reduce the demand for wood fuel and thereby reduce deforestation. The power station will provide energy for both homes and industry. The development of infrastructure and the availability of energy will open up the area for further development, and substantial employment opportunities will be created. The detrimental effects on the other hand, unless controlled, could be severe, both physically and socioeconomically.

Mining by its nature can have major effects upon the land, and could have a severe impact on agriculture in the area. Extensive surface facilities will be required. Substantial quantities of waste material as well as product material will be brought to the surface and must be disposed of. The product itself, other than that conveyed directly to the power station, will have to be transported away, leading to a major increase in heavy traffic and producing an increase in vehicle emissions. Dust emission is almost inevitable. Contaminated water will be pumped from the mine as well as from the coal washers which, if discharged untreated into existing water courses could have wide ranging effects. Subsidence will almost certainly occur in the future, and without a restoration programme, will lead to water filled depressions giving rise to mosquito breeding.

Any development work, particularly in an impoverished developing country like Bangladesh, inevitably causes the migration of outlying rural populations to the vicinity of the development in search of jobs. Large-scale mining projects are no exception. The socioeconomic effects on a community can be beneficial. Care must be taken, however, to avoid the "boom town" effect of uncontrolled secondary development, growth of slums and shacks and of dissension amongst differing cultures and communities. Consultation with local communities is an essential part of any EIA.

The hard rock mining projects may have similar problems to those of the coal mining project but without the added complexity of a power station. There is unlikely to be future subsidence because of the differing geology, but the questions of waste and water disposal will remain, as will the impact of increased transportation traffic.

Most of the physical effects of mining and associated developments can be at least mitigated and kept within acceptable limits, if not eliminated, by the imposition of adequate and stringent technical and emission standards on operators and developers through legislation. However, the imposition of the most rigorous standards will have no effect if the standards are not enforced and the operations monitored. For this purpose, a regulatory body with legal powers must be established with sufficient numbers of suitably qualified personnel. In developed countries there are already well established "inspectorates" which can form a model for the developing countries of the region.

Socioeconomic issues will also require local government, and conceivably central government, intervention if detrimental effects on the community are to be avoided and the benefits developed. Local consultation is an essential feature, which is probably best provided by local government.

It is the enabling legislation and the establishment of regulations and regulatory bodies which must now be addressed, initiated and developed in Bangladesh. The existing mining laws and environmental standards are being modified, as necessary, to meet the requirements of international environmental practice.

On a broader basis, however, consideration must be given to the potential effects on neighbouring states as well as on the immediate locality. This is particularly true of atmospheric emissions which may cause "acid rain" and of the use (and misuse) of shared water resources and waterways.

Many of the countries of South Asia and South East Asia are close neighbours mutually affected by natural climatic conditions. The monsoon winds and rains, the major water courses and tidal movements recognise no artificial man made boundaries. Consequently, the actions and developments of one state can have a profound effect on the populations of other states. With the rapidly increasing industrial development in the region, there is already a great need for a closer collaboration and coordination in formulating and imposing standards for and controls over effluent and emissions. This need becomes continuously greater and now requires to be urgently addressed. It is hoped that this conference will be only the first move in that direction.

Mining environment regulations and P.T. Aneka Tambang activities

Machfuddin Husen Alhander
P.T . Aneka Tambang
Indonesia

INTRODUCTION

PT. Aneka Tambang has five operations throughout Indonesia:

- Pongkor Gold Mine in West Java.
- Kijang Bauxite Mine in Bintan Island.
- Pomalaa Nickel Mine in South-East Sulawesi.
- Gebe Nickel Mine in Maluku.
- Cilacap and Kutoarjo Iron Beach Sand Mines, both in Central Java.

On the basis of annual production, all the mines can be considered as small to medium scale mines compared to other mines in the world.

THE ENVIRONMENT REGULATIONS

Presidential Decree No. 32 Year 1990, concerning management of preserved (protected) areas stipulates that "the seashore area, 50 metres from the high tide, is a protected area". Some mineral deposits such as iron sands, bauxite and nickel are found at the seashore. After reclamation activities are carried out, simultaneously with or after mining operations have ceased, the mine site can be properly restored. Examples are provided by previous iron beach sands mining locations in Cilacap and by Lemo Island in Pomalaa.

Minister of Life Environment Decree number 03/MENKLH/II/1991 sets waste water standards. The standards are national. They do not take into consideration mine capacity, the ability of the company to carry out reclamation programmes or the location of the mine. Accordingly, the same sophisticated technology for waste water treatment is required for every mine. This creates an unfavourable climate for investment because the sophisticated technology requires extra capital investment. In order to attract new investment and to make investment opportunities wider, the implementation of this regulation should be re-evaluated, especially for mining operations in remote areas where populations are small.

Chapter 15, Verse 1, of the Mining Law No.11 Year 1967, concerning Basic Mining Regulation, states that "mining business should only carried out by a mining company or an individual if the mining permit has been granted to them." In areas mined by P.T. Aneka Tambang such as the Gold mine Project in Pongkor and the Iron sands Mine in Cilacap, informal and illegal mining sometimes occurs. These illegal operations in the company's area have interfered with the company's operations. Often P.T Aneka Tambang is blamed for environmental damage and pollution which has been caused by illegal operations. When this happens, the holder of the mining permit should be protected from having to take responsibility for the adverse effects and the illegal miners should be held responsible. The law should be enforced and the Governments's capacity to solve this problem should be strengthened.

Director General of Mines Decree Number 07/DU/1978, Prevention and handling for environment pollution and disturbance caused by surface mining activities, states in Chapter II, Chapter 8, verse 1 (Reclamation and Pollution Prevention): "Reclamation should be started at the latest six months after mine closure or in accordance with the reclamation plan and should be finished when the mining permit comes to an end". Nickel ore reserves in some areas can at present not be mined to exhaustion, because the ore has to be blended with ore from other mines to meet market or smelter quality standards. Accordingly, reclamation at these mines should be postponed until operations have finally finished. However, Mine Inspectors' instructions on how to resolve such situations often vary. This leads to confusion.

Director General of Mine Decree Number 667.K/201/1986, deals with the responsibility of the holder of a mining permit (KP). Reports made by the holder of a mining permit under the Indonesian Environmental Impact assessment procedure, including reports on Environmental Management and Monitoring, number approximately 21 per year. This represents an excessive number of reports. The number of reports that the mining permit holder is required to produce could hopefully be reduced and the environmental assessment process in Indonesia could thereby be simplified.

CONCLUSIONS

- The application of President Decree No. 32 year 1990 to mineral deposits on the seashore should be implemented in accordance with the situation and condition of the individual deposit.

- The application of Life Environment Minister Decree No.03/MENKLH/II/1991 concerning waste water quality standards, should take the size of production capacity, the ability of the company to carry out reclamation and the location of the deposit into consideration.

- Special protection is needed for KP (mining permit) holders from illegal mining activities in the area granted in the mining permit.

- Director General of Mine Decree No.7/DU/1978 concerning reclamation should be tailored to take into consideration the characteristics of the deposit, especially as regards nickel deposits.

- The number of reports to be submitted to the government agencies in order to fulfil Indonesia's Environmental Impact Assessment, Environmental Management and Monitoring procedures should be reduced.

Environmental regulation and mining in the Union of Myanmar

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INTRODUCTION

As Myanmar considers a rich pool of biodiversity and mineral resources as important national assets. the Government of Myanmar has drawn up strict regulations to protect its reservoir of biodiversity and biological resources. and to promote careful planning of mineral exploitation. Myanmar believes that the environment and development are closely linked. In pursuing economic growth and development. it is important to consider environmental issues in order to achieve sustainable development. At the same time. it is believed that only the attainment of a reasonable level of development will ensure a sound environment. Poverty causes environmental degradation and alleviation of poverty would go a long way towards protecting the environment.

The mining industry in Union of Myanmar is controlled by the government and the private sector. As a result of the rapid growth of the mining industry it has become important to review the environmental policies and the impact of mining activities on the environment.

ENVIRONMENTAL POLICIES. LEGISLATION AND INSTITUTIONS IN THE UNION OF MYANMAR

The Union of Myanmar is still in the process of formulating a comprehensive national environmental policy encompassing all aspects of environmental conservation and protection. However. various ministries already have their own conservation and protection guidelines. Although Myanmar still lacks a comprehensive environmental legislation. there are legal instruments and specific legislation which permit Ministries and Departments concerned to carry out their mandates in their areas of competence and responsibility. Thus. there are laws such as the Forest Act. Food and Drug Act and Mines and Minerals Act.

The Government of the Union of Myanmar established the National Commission for Environmental Affairs (NCEA) in February 1990 with the following objectives:

- To establish sound environmental policies in the utilization of forests. water. land. mineral resources. marine resources and other natural resources in order to safeguard the environment and prevent its degradation.

- To set environmental standards and to lay down rules and regulations to control pollution covering water pollution. air pollution. noise pollution. disposal of hazardous wastes and chemical wastes.

- To lay down short. medium and long term environmental policies and strategies that takes account of both environmental needs and development requirements.

- To promote environmental awareness through information and education and promote public participation in environmental protection endeavours.

•To facilitate international cooperation with international institutions on environmental matters.

All mining or mining related activities are covered by the following Acts:

a) Mines Acts
    (i) The Land Acquisition (Mines) Act
    (ii) Union Mineral Resources (Grant of Right of Exploitation)(Enabling Act)
    (iii) The Burma Metalliferous Mines Manual
    (iv) Mineral Concession Rules 1957
    (v) Union of Burma Mines and Minerals Act 1961
    (vi) Mineral Resources Development Corporation Act 1965

(b) Explosives Acts
    (i) The Explosive Act 1884
    (ii) The Explosive Substances Act 1908

(c) Jade and Gem Acts
    (i) The Upper Burma Ruby Regulation 1887
    (ii) The Jade Mines Regulation 1940

The mining legislation is composed of two main documents: the Burma Metalliferous Mines Manual 1937 and the Mineral Concession Rules of 1913. an Indian regulation subsequently amended and adopted in Yangon on 18 November 1957. The Burma Metalliferous Mines Manual 1937 laid down the legal framework for the regulation of mining activities and also includes provisions for the safety and health of miners and their working conditions. Mining laws like other laws in Myanmar have their origin in colonial rule and the colonial legal system. Much of the substance of the legislation is now incompatible with the current situation. Apart from out-dated mining laws requiring review and revision. new laws to regulate industries in the interest of environmental protection will soon be required.

The Mining Law and Regulations Reviewing Central Committee has been formed under the Ministry of Mines to undertake:

(a) To list the existing mining laws. rules and regulation:

(b) To review the list of mining laws and discuss whether to abolish. revise or introduce new laws:

(c) To draft revised and new mining laws and regulations.

The task of reviewing and drafting laws is assisted by United Nations Centre for Transnational Corporations.

Encouraging environmental protection through economic incentives follows the patterns of other incentive programmes already well accepted in society and it seems to work. In the past some voices have argued about a conflict between economics and ecology. To make this argument. proponents put forth elementary market principles guided by price alone. In a world governed by ecological rules. on the other hand. the so called "Homo ecologicus" would make choices based only on ecological principles. It is thought that economic incentives provided through the price system will become the simplest means of conciliating the economy and the environment while providing individual localities, countries and regions with decentralised control over their fates.

In laying down pollution control standards, it should also be born in mind that smaller crude plants were the predecessors of the larger, efficient plants of industrialised nations whose pollution control standards can be very stringent. If these same stringent standards of pollution control were applied without discretion or consideration, the small, crude plants in less developed countries would find it hard to conform and to survive in order to develop technologically. The smaller, less efficient plants should be allowed to grow in their own environment under specific pollution control standards. Therefore, approaches to environmental regulation should be widely discussed and it is advisable to set environmental objectives individually for each project, especially for the developing countries in Asia and the Pacific. The Governments of the region can benefit to a large extent from the experiences in other countries. However, a careful assessment should be made before laying down regulations so that they are relevant to local traditions, values and the existing state of development.

The extent of pollution and its impact on the environment should be thoroughly assessed and taken into consideration by the developing countries. Previously many developing countries felt that they had to postpone dealing with environmental protection in order to concentrate on economic and social development: relieving poverty took priority over environmental issues. Reports such as "Our Common Future" issued by the World Commission on Environment and Development emphasized how environmental protection could be reconciled with development. Economic growth does not have to translate into more goods, it may also mean better goods. Prosperity and welfare should be seen not only as growth in material welfare but also as a wider social concept covering employment, environment and a meaningful life. We must leave enough "environmental space" for future generations.

In Myanmar, there is real and visible deterioration in the environment due to the mining and metallurgical industries. In Taninthayi (the Tennesarin), many years of extensive tin and tungsten mining created stream pollution over the years so that the Dawe (Tavoy) River is now silted and has become too shallow for good navigation. At the Namtu/Bawdwin mines, the consumption of mine timber has been so great during the past 70 years that it is now hardly possible to find a sufficient amount of saw logs in the area. A smelter operation with its ensuing smoke, dust, heat gases and sound could generate over thirty different pollutants. The varieties, amounts, concentrations, individual harmful effects and toxicity multiplied by the size and number of operations gives us an extensive measure of pollution the impact of which on the environment could be significant. These are only a few examples which should be taken into account in the environment conservation efforts of the mining industry.

Availability of specialised personnel for preparing and reviewing environmental impact assessments is crucial for developing countries in carrying out the environmental conservation task in the mining sector. It is also important to exchange views at the national, regional and international level, and expert opinions should be obtained from international organisations which are responsible for environmental conservation in the mining industry.

CONCLUSIONS

The survival and development of Myanmar is dependent on its natural resources. This makes it imperative for Myanmar that national environmental policy and regulatory measures focus on the conservation of national resources. The basic philosophy has been that the natural environment be protected and its health promoted while its resources are developed. There must be development, for development can ensure a higher standard of living for people who are the point and purpose of all these endeavours. Life should be lived within a qualitatively better environment. Myanmar cannot handle the environmental problems of development with her own means and resources. It needs the environmentally sound knowledge and technologies that are at hand or which will be developed in the future. It will also need additional funds to cover the incremental cost of environmental protection and regeneration projects. Both the funds and technical help will have to come from the more advanced countries. Though Myanmar's contribution to environmental degradation of the planet is minimal, present global problems threaten the very survival of the Earth. No nations however mighty or powerful can act alone to save the planet. All nations must work together. Those nations which contribute most damage to the environment and which also have the most resources, intellectual and material, should contribute most to the resolution of the problems and to the saving of the planet Earth.

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Environmental Management for the Thai mining industry

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TRENDS IN THE MINING INDUSTRY IN THAILAND

The exploitation of mineral resources is of major importance in Thailand because of the contribution to gross national product, foreign exchange earnings and provision of job opportunities. The industry can be divided into two categories: first, the producers of minerals for export, who are dependent on the world market, and second, the producers of domestically consumed minerals, where exports are created only when a domestic surplus exists. Currently, more than 50 minerals are produced and 30 are considered economically significant. Lead, barite, fluorite, quartz, feldspars, tin, antimony and gypsum are mainly exported. Other minerals such as lignite, zinc, kaolin, ball clay, limestone, glass sand, shale and phosphate are mostly consumed in the country. As a consequence of the economic boom in Thailand, the ratio of consumption to production is gradually increasing, while the ratio of export to production is declining. A change towards the use of more indigenous raw materials for the domestic downstream industries can be expected. In addition. increasing energy demands are reflected in the quadrupling of lignite production since 1984. with a planned further quadrupling from the present level by the year 2000. when. it is estimated. lignite will supply in excess of 50 per cent of Thailand's power requirements.

During the last decade. steps for the abatement of pollution and environmental degradation from mining activities have been taken to change the image of the mining industry. These steps also ensure effective environmental control and appropriate planning to cope with the future development of non-renewable mineral resources. At present. there are a number of mining companies operating in the country. all of which are conscious of their role in the protection of the environment.

ENVIRONMENTAL REGULATORY AGENCIES

In Thailand. minerals are owned by the State. The government agencies responsible for the regulatory aspects of mining sectors are the Ministry of Industry (MOI) and the Ministry of Science. Technology and Environment (MOSTE).

In accordance with the new Enhancement of the Environment Act and institutional arrangements which have been effective since June 1992. the Office of National Environmental Board (ONEB) was replaced by three agencies: the Office of Environmental Policy and Planning (OEPP). the Pollution Control Department (PCD) and the Environmental Quality Promotion Department (EQPD). These three new agencies are under the responsibility of MOSTE. The OEPP is responsible for developing national environmental policies and planning. establishing ambient environmental quality standards and approving all Environmental Impact Assessments (EIAs). The PCD and the EQPD are at present not involved directly in the mining industry. but they are empowered to some extent by the Act to monitor and control the environmental quality of the country.

The Department of Mineral Resources (DMR) under the MOI is responsible for issuing licenses. establishing emission standards. monitoring compliance. and enforcing regulations for mining activities. In 1978. the DMR established an environmental unit. and in 1988. this unit was expanded to form the Division of Environment. enabling the DMR to carry out its mandate effectively in the environmental field.

With regard to mineral exploitation projects in national reserved forests. the Royal Forestry Department under the Ministry of Agriculture and Cooperatives is also empowered by the Forestry Act of 1941 and the National Reserved Forest Act of 1964 to permit the use of forest land for mining.

MINING LEGISLATION RELATING TO ENVIRONMENTAL PROTECTION

The Mineral Act was issued in 1967 and has been amended three times: in 1973. 1979 and 1983. The Act is administered by the MOI through the DMR. Under the Act. a mining concession or lease is required before mining can take place.

Although the main objective of the management of mineral resources was the acceleration of mineral exploration and optimum exploitation of the country's identified mineral reserves. awareness of the need to protect other natural resources and assure the safety of people led to the issuing of a number of decrees. Under the Mineral Act. the developers are required to provide a mining plan showing the method of storing tailings and turbid water, control or treatment of dust, noise and vibration, and treatment of poisonous materials. If no poisonous materials are employed this must be stated. The drainage system for the mine and mineral processing facilities must also be shown. Any pit, winch or shaft which is no longer used in the mining operation must be filled up and the mined area must be reclaimed for the future use. The miners must operate their mines in conformity with the approved mining plans.

In mining operations, the miners shall not obstruct, destroy or undertake any work which may be detrimental to the use of highways or public waterways. Neglect or infraction of any of the conditions imposed in the mining plan can lead to suspension of the lease, fines and, as a last resort, jail sentences for company directors.

A significant section in the Act relating to pollution control is Section 55. It allows a surface rental fee to be charged in addition to the normal fee for the mining lease. This fee does not exceed 10 per cent of the royalty and is paid to the DMR. DMR is required to use these funds to reclaim mined areas, enforce the Act, and develop the local area where the mine is located. Collection and allocation must follow Ministerial Regulations.

In accordance with section 18 of the Mineral Act, a Committee responsible for giving advice and recommendations to the Minister of Industry on the enforcement of the Act has been established. The chairman of the Committee is the Under-Secretary of State of MOI. Other members are the Director General of DMR, the Director General of the Royal Irrigation Department, the Director General of the Land Development Department, the Director General of the Royal Forestry Department, the Secretary General of OEPP and two other persons appointed by the Minister. All mining permits are considered by this Committee before being granted by the Minister of Industry.

ENVIRONMENTAL LEGISLATION RELATING TO MINING

In addition to the Mineral Act, two other Acts concern environmental protection and management of the mining industry: the Environmental Act and the Forestry Act.

The most important environmental law for the mining industry is the Enhancement and Conservation of National Environmental Quality Act of 1992, which is administered by the OEPP. The Act covers four issues relating to mining :

(1) Mining projects of any size must submit an environmental impact assessment (EIA) report to the OEPP for approval before commencement of the activity.

(2) Environmental standards, for example, the standards for surface water quality and ambient air quality, are predetermined and all economic activities, including mining, must comply with them.

(3) The OEPP has authority to designate any natural area as an environmentally protected area in order to control its use.

(4) the Act establishes an environmental fund for the Thai economy. This fund can be another source of money from which miners can borrow for environmental mitigation and reclamation activities.

The forestry law regarding mining operations involves designation of forest areas as either open to or prohibited for mining. The prohibited areas include national parks, wildlife sanctuaries, class 1 A watersheds and areas considered as national heritage sites. Mining in general forest areas is controlled by the Forestry Act of 1941. Mining in reserved areas of natural forest must conform with the National Reserved Forest Act of 1964. The operators must get permission to use the land from the Royal Forestry Department, prior to getting a mining concession from the DMR.

PROBLEMS OF PRESENT ENVIRONMENTAL MANAGEMENT AND MITIGATION FOR THE MINERAL INDUSTRY

Most countries have environmental regulations for the mineral industry. Their effectiveness depends on the awareness of the people and on law enforcement. Developed countries seem to have clearer and more systematic laws and guidelines for environmental protection. The environmental effects of mining in developed countries are subject to a wide array of laws and regulations. In contrast, environmental regulations and legislation in developing countries are much further behind. They are either nonexistent or ineffectively enforced.

In Thailand, the environmental requirements for the mining industry are not much different from those of most developed countries. They include :

1) Protection of conservation and protected areas from mining, including:
    a) Conservation areas consisting of national parks and wildlife sanctuaries.
    b) Protected areas consisting of class 1 watershed areas, marine parks (coral reef reserves), mangrove forests, archaeological and historical areas and recreation areas.

2) Requirement for EIA approval of mineral development projects in applicable areas under the environmental law.

3) Approval of mining plans and imposition of environmental protection conditions by DMR.

4) Overall approval of mining proposals by the advisory committee under the Mineral Act and granting of mining lease.

5) Inspection of mining operations and enforcement.

Although environmental regulations and laws exist, environmental impacts from mining activities still occur. The problems occur due to several flaws in the regulatory system:

1) Inappropriate or lack of public land-use planning; e.g., setting aside land for various types of conservation causes conflicts between miners and those advocating the use of land for other public purposes. This results in inefficient and drawn-out approval procedures which impose substantial costs, delays and uncertainties which can jeopardise the viability of mining projects.

2) Low investment (leading to inadequate exploration and poorly equipped mines) result in unattainable and/or unreliable mining plans.

3) Inappropriate conditions and regulations set by the OEPP make it difficult or unreasonable for miners to observe conditions. Inattentive preparation of the EIA renders it useless when put into

practice.

4) Inappropriate mining plans, lack of appropriate environmental pollution mitigation measures, insufficient monitoring and environmental auditing cause inefficient environmental protection and control.

5) Inadequate technology for mining operations and high competition in the mineral markets lead to unsatisfactory environmental protection practices.

6) Lack of law enforcement and leniency of the officials contribute seriously to the severity of the environmental degradation caused by the mining industry.

7) The performance guarantee schemes for mining activities are not yet in force.

RECOMMENDATIONS FOR IMPROVING THE LEGISLATIVE AND ADMINISTRATIVE FRAMEWORK

- In attempting to resolve conflicts over land use, the relevant agencies should use a transparent and well defined procedure in their decision making process and where possible use a cost benefit analysis to resolve land use issues. It should be clear to all involved that an objective assessment of land use has been made.

- Improve public participation in mineral development planning, through improving the communication of information regarding mineral projects to the public. This can be done by ensuring the publication of exploration and mining proposals, terms and conditions in brochures and in the media, organizing public information meetings and site visits, and ensuring that all conflicts are dealt with in a fair and formal process of dispute resolution.

- Improve communication and consultation between government agencies and the mining industry. Guidelines should be published to clarify government policy statements and legislation. Agencies should continue to consult regularly with each other and with industry in order to keep up with developments and minimise inconsistencies, ensure that regulations are relevant and appropriate, and encourage industry to develop industry based solutions to environmental problems.

- Environmental management should be made an integral part of the decision making and regulatory process in relation to exploration and mining.

Mineral resources development and environment in Bhutan

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BACKGROUND

The small Kingdom of Bhutan lies on the southern slopes of the Eastern Himalayas, landlocked between China and India. It has a surface area of 46.500 km^2 and a population of about 0.6 million with a per capita GNP of US$ 425. Nearly 22 per cent of the total area of Bhutan enjoys a protected status. Until 1961, the Kingdom of Bhutan remained in self-imposed isolation. Thereafter, it has gone through six successive Five Year Development Plans and is today well into the middle of its seventh plan (1992-1997). Bhutan is committed to achieving social and economic development without ravaging and impoverishing its land, environment and resource base. It is the policy of the Royal Government of Bhutan (hereinafter RGoB) to ensure that the country's development is sustainable even though this will involve exercising controls or placing deliberate constraints on the exploitation of its identified natural resources so as to achieve a pace of economic growth that can be sustained in the long run. It has chosen a path of development that recognizes and integrates environmental imperatives with national development policies, plans and programmes.

RATIONALE FOR DEVELOPMENT OF MINERAL RESOURCES

Present day economic realities dictate that Bhutan must finance the increasing costs of government administration and various development programmes. In addition, it has to close the gap that exists between its imports and exports, service its debts and gradually reduce its dependence on foreign aid. To do this, the country will need to exploit its natural resources such as forests, minerals and hydropower, and develop its industrial sector which relies on these resources. However, the strong forest and nature conservation policies which exist today limit the growth of forest or wood-based industries. Therefore, in the future the country may have to concentrate and rely increasingly on making practical use of its hydropower and mineral resources to achieve desired levels of economic growth. RGoB is, however, fully aware of the drastic environmental consequences that can result if these vital sectors are developed without adequate planning, that is without considering their likely long-term environmental impacts.

MINERALS SECTOR CONTRIBUTION TO THE NATIONAL ECONOMY

A systematic geological survey has covered 35 per cent of the country. During the last 33 years numerous deposits of lead, zinc, iron ore, coal, limestone, talc and building stone have been discovered. In 1987 (start of sixth Five Year Development Plan) the contribution of the mining and quarrying sector to the national GDP was a negligible 1 per cent. Today, it is estimated at slightly more than 3.2 per cent (CSO, 1992). Total earnings from mining and mineral based industries today is about Nu. 750 million per annum (of which 9.2 per cent as export sales to India and third countries). Nearly 60 per cent of the revenue generated by major manufacturing industries comes from the minerals sector.

IMPACT OF MINING ON THE ENVIRONMENT

There are some inherent technical problems for open cast mining in Bhutan's Himalayan terrain. Especially in the Lesser Himalayan region (partly the foothill region) the rock formations are highly fractured and they become loose and unstable with human activity such as a road construction or mining. The slopes and gulleys are usually very steep. In addition, the mineral deposits which are currently mined are not uniform in shape and size, so the surface mines can at best be semi-mechanized or are operated manually. Overburden dumping on the hill sides is unavoidable. However, at present the impact of mining activities and mineral based industries on the environment in Bhutan is negligible, mainly because these activities are small, few in number and rather dispersed in location. The total land area occupied or utilized by this industry is less than 0.01 per cent of the country's total surface. Given this situation, preemptive efforts now being initiated will serve to effectively minimize any environmental degradation resulting from future mining activities.

MINING REGULATIONS

Although Bhutan's mining industry has seen less than a decade of development, regulatory mechanisms are evolving, especially as regards controlling environmental pollution caused by mining operations. The Department of Geology and Mines (DGM) has the responsibility for regulating all mining operations in the Kingdom but has yet to be given the legal authority to fulfil this important responsibility effectively. The DGM is also in charge of leasing proven mineral deposits to private investors (with approval from the Ministry of Trade and Industry (MTI)). In the absence of a Mining Act and Mining Rules and Regulations, it has been using Clause VIII, X(ii) and XI of the Lease Agreement (which has Clauses I to XIX) as an instrument to regulate and monitor mining operations to some extent. A Bhutan Mining Act has now been drafted by DGM together with the Legal Division of the Ministry of Trade and Industry. However, it requires further improvement and fine tuning so that it does not contradict other existing and proposed laws of the land. The proposed draft is to a large extent based on the Mines and Minerals Act of India. However, Chapter VII of the proposed Act provides for environmental protection and includes seven sections covering: protection of environment, preservation of top soil (removal storage and utilisation), mine reclamation and rehabilitation, precautions against ground vibrations/noise/air pollution, discharge of toxic waste and protection and restoration of flora. Finalising the draft Bhutan Mining Act and getting it enacted is one of the DGM's major objectives during the current seventh Plan, since the number of mines (although small-scale) in the country is increasing every year and their individual or collective impacts on the surrounding environment will soon become significant and require continuous monitoring and control supported by a legal entity. There are some social considerations which will have to be addressed during the drafting of mining rules and regulations, following the enactment of Bhutan's Mining Act when that occurs. First of all, appropriate environmental quality standards for the mining sector have to be established. The key word is "appropriate", meaning that the standards will have to be achievable by Bhutan's small mining companies in order to ensure a high rate of compliance. The standards will have to be established with the help of experts from the DGM (MTI) in collaboration with the National Environmental Commission and other environmental agencies in the country.

For at least another decade, strict mining rules and regulations and environmental imperatives will severely and adversely affect the economic viability of small-scale mining ventures in Bhutan. These are, of necessity, low capital investment operations which are profitable only if they are semi-mechanized or manually operated. Given the severe constraints placed on mining methods by Bhutan's rugged topography, made more difficult by the nature of the mineral deposits (small, discontinuous and erratic), there is little scope for large-scale mechanized mining. Therefore, for Bhutan's mining sector, it appears that a "command and control" approach (which might have strong initial appeal) alone will not work to achieve environmental objectives in the long run. Rather, the approach would have more merit if it were combined with economic incentives and other measures that will improve the investment climate in the minerals sector, such as streamlining procedures for leasing the deposits, granting longer lease periods to allow mines development, and formulation and implementation of appropriate mineral taxation methods. The normal procedure currently followed before the granting of mineral leases or mining permits is that the project investor must obtain clearances from the Division of Forest Services (DFS), Department of Roads (DoR) and the National Environmental Commission (NEC), and submit a detailed mine plan showing how the mine will be operated and the site reclaimed after the mine has been abandoned. However, in reality and in the absence of a Mining Act and a comprehensive set of mining rules and regulations, there are no controls over mining practices or no guarantee that mined-out areas will be reclaimed as proposed by an investor.

ENVIRONMENTAL IMPACT ASSESSMENTS

Environmental impact assessments have so far not been a mandatory pre-requisite for mining or minerals projects, although for major hydropower projects such assessments have been carried out as part of Detailed Feasibility Studies. Environmental Impact Assessment Guidelines for Bhutan exist, drafted by NEC in 1993. The Guidelines have now been commissioned by the RGoB, recognizing that an effective way to ensure the long-term sustainability of its natural resources is to institute EIAs as a routine procedure for all development projects, including, of course, mining projects.

It is proposed that the NEC categorise projects according to their possible environmental impact and ensure, through legislation, that development activities with potentially major environmental impact undergo a full EIA, while projects with minor impact would have a partial EIA. Minor projects with insignificant environmental impact would not be subject to an EIA. The screening of proposed projects for the need for an EIA would be approved by the NEC. The EIA, when carried out by the project proponent, would be evaluated by the NEC, and the NEC would recommend to the RGoB whether the project design should be amended in order to mitigate negative environmental impacts or be rejected. In special cases, with directives from the RGoB, the NEC would conduct the EIA. All full or partial EIAs should contain procedures for regular NEC review to ensure that the development activity is under appropriate environmental management and control. Sectoral outlines for conducting EIA's will be published by the NEC, starting with manufacturing industries and hydropower projects. There is a strong possibility that most of Bhutan's small-scale mining industry will not be able to afford the costs and expert services required to carry out EIA surveys. Under the Sector Support Programme proposed by the NEC Secretariat, the need for technical assistance including training of personnel in environmental impact assessment by major manufacturing industries in Bhutan has been identified.

EMERGING ENVIRONMENTAL INSTITUTIONS

The **National Environmental Commission** (NEC) was established in 1989 with the mandate to formulate a National Environmental Strategy, coordinate all environmental activities and monitor the environmental impacts of development. The long-term objective of the NEC is to define and establish policies and plans to fully integrate the sustainability of resource use and management of wastes with every aspect of the country's social and economic development. The final draft of the strategy will be submitted to the Cabinet for endorsement. It will be an important precursor of an umbrella environmental legislation, the

National Environmental Protection Act. which is being proposed by the NEC to the Royal Government.

ENVIRONMENTAL LEGISLATION

The NEC Secretariat. under the auspices of the Commission. will soon be embarking on the process of establishing appropriate environmental legislation. The need for a basic National Environmental Protection Act (NEPA) has been recognized. as the RGoB now has no legal basis for limiting pollution or controlling the degradation of the natural environment in the future. and since enforcement measures and penalties for non-compliance do not exist. The National Environmental Protection Act will be the mother Act. based on which necessary regulations can be developed. It is now being formulated and there is a need to ensure that it does not conflict with traditional customs and laws or any existing laws and regulations.

Quality Standards

With technical assistance. the NEC secretariat will be evaluating the situation in Bhutan and recommend a feasible programme for implementing a system of preparing appropriate Environmental Quality Standards (EQSs) for various RGoB sectors. The EQSs that will be established for Bhutan will focus on urbanising and industrialising areas. water supply and sanitation activities and effects of mining activities on watersheds.

Master Plans

A Sector Support Programme of the NEC is currently proposed which will provide assistance to develop a Master Plan for development areas such as mining areas and industrial estates. The proposed Master Plan for mining areas. prepared after a thorough survey of mining activities in the country. will reflect the current state of the environment in such areas and recommend future actions to be undertaken by government regulatory bodies concerned and the mining companies themselves.

SUMMARY AND CONCLUSION

Bhutan is a developing country with a natural environment more or less in its original state. Its resources (forests. hydropower and minerals) are yet to be exploited. But before long there will be increasing pressure on both its natural environment and resources as the country strives continuously to meet the basic needs of its people. Utilization of its mineral resources offers one of the few realistic avenues to bring about desired levels of economic progress and thereby increasing its self-reliance as a country.

At present. only non-metallic minerals (limestone. gypsum. dolomite and high-silica quartzite). including high-ash friable Gondwana coal and construction materials. are extracted. Bhutan's copper. lead-zinc and tungsten deposits are considered sub-economic as they are small and located in remote areas. Their status may change in the future with better access to technology and hydroelectricity. improved internal communication and transport networks and increased demand for such metals in neighbouring countries.

There are some major constraints facing the development of the minerals sector. including the limited size of the national labour force. limited access to appropriate technology and inadequate marketing information networks and facilities. Since the mining industry in Bhutan is in an early stage of development. rules and regulations to minimize its likely environmental impacts are evolving with experience from the past. There are now clear-cut policies and laws which serve to protect watersheds. forests and wildlife. and it is most probable that certain environmental laws will be passed in the near future which will definitely have implications for the development and exploitation of mineral resources in Bhutan

Although the impact of mining operations on the local environment may be considered insignificant at present. a need has been strongly felt. in the larger interest of preserving the natural environment. to monitor and regulate these operations and those which may take place in the future. To achieve this important environmental objective. the DGM has proposed a Mining Act which has now been formulated and is under review by the Ministry of Trade and Industry of RGoB. A National Environmental Strategy (NES). covering all pertinent sectors is being formulated by the NEC. EIA requirements may soon become mandatory for major and minor development and industrial projects.

A National Environmental Protection Act (NEPA) is also being proposed by NEC which will serve as the basic Act. authorising the formulation and implementation of other related rules and regulations as effective tools to protect and preserve Bhutan's natural heritage. These remarkable changes may well take place within the coming eighth Five Year Plan (1997-2002) if not in the current Plan.

On the other hand. out of the necessity to develop further Bhutan's minerals industry. economic incentives are provided by the RGoB to this sector. including subsidized power supply. lower lending interest rate on loans. duty-free import of mining and plant machineries. and relevant training and technical assistance.

Furthermore. the DGM. the country's geological survey and mineral exploration organization. receives a significant budget from RGoB every year for carrying out geological surveys and mineral exploration programmes. and also for the regular inspection of small-scale mines in the country. The costs and financial risks of exploration programmes are borne by RGoB so that proven deposits can be leased to the private sector. This. in itself. is one the most significant incentives provided by the RGoB to encourage private investment in the minerals sector.

In conclusion. Bhutan is one of the few countries in the world where the principle of sustainability is becoming firmly established in government policies. Serious attempts are being made to translate it into actions through various development programmes and activities. One has yet to see how Bhutan's small and growing minerals industry develops within the overall context of national environmental consciousness which shows every sign of growing stronger with each year. For the country as a whole. balancing immediate economic imperatives with long-term environmental objectives will no doubt constitute a continuous and difficult challenge as it enters the 21st century.

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Environmental permitting of new mining operations in various countries

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INTRODUCTION

In this paper, the author provides his impressions of the advantages and disadvantages of permitting systems that apply to new mining projects in various countries. Specific observations are made of those countries where the author has experience through participation in or direction of environmental impact assessments. These countries include:

- United States
- Australia
- Canada
- Philippines
- Indonesia
- Papua New Guinea

OVERALL CONCLUSIONS

The "best" environmental permitting systems for new mines are generally found in the countries or states which have many operating mines. "Best" in this case is the author's subjective assessment of what works most efficiently and with the least frustration to all those involved - regulators, proponents, environmental lobby groups and consultants. The "worst" systems - that is, those that cause the most frustration to the mining industry - are those in countries or states with few, if any, operating mines. Particularly difficult permitting situations are found in countries or states with a legacy of environmental damage from old abandoned mines, but with few or no examples of modern, well managed operations.

The other main conclusion, based on observations of a wide range of permitting systems, is that each project needs to be evaluated on its own merits. Not only is each mining project unique, but the environmental characteristics and attributes that will determine the impacts differ from site to site, even between sites in close proximity.

COMPARISON OF ENVIRONMENTAL PERMITTING IN VARIOUS COUNTRIES

United States

As is well known, the permitting system in the United States is very complex. It may involve many different state and federal agencies. Mining activities and their environmental effects are controlled by many laws and regulations. Understanding and interpreting the regulations can be difficult. As a result, it is almost impossible for environmental personnel in mining companies to be knowledgeable of all the laws that may affect their operations. In addition, some laws are interpreted differently, even within the same agency, from one part of the country to another.

Within the United States, environmental permitting varies considerably from one state to another. The state of Nevada, one of the major mineral producing areas, is considered by the mining industry and also by some environmental lobby groups to have the "best" permitting system. Best in this case means that which is most appropriate to the circumstances in Nevada. The permitting system was developed by the state in close consultation with the industry. However, it is by no means lenient towards the industry. Good features of the Nevada system include:

- Regulations have been developed specifically for the mining industry.

- Regulations prescribe minimum acceptable design requirements based on local conditions, but allow for more stringent conditions to apply when indicated by local circumstances.

- Regulations are technology driven which means that goals can be achieved with available technology.

- Companies are required to submit closure plans as part of the permitting process.

In contrast to the reasonable and reasoned approach adopted by Nevada regulators, the system followed by the United States Environmental Protection Agency (EPA) is anything but reasonable. The main problems stem from the adversarial approach in which each mining proponent is treated as a guilty party until it can prove itself innocent. This approach accentuates any existing polarization of opinions between the proponent and opponents and makes it difficult to negotiate a compromise.

There is fear in United States agencies of being taken to court. Every written product is closely scrutinized by lawyers. As a result, it takes a long time to reach a decision and even relatively simple communications can be heavily qualified. To help overcome these difficulties, the EPA prefers to impose uniform standards to be achieved by all projects - whatever and wherever - rather than considering each project on its own merits.

Fortunately, EPA opposition can be overcome, and some technical arguments can eventually win over unsound emotional opposition, but this requires extended and expensive legal proceedings. As a result, there are many sound projects that are not developed and many more where large sums of money that could usefully be applied to environmental improvement are spent unproductively in following bureaucratic procedures and navigating through legal minefields.

Even worse is that some laws and regulations are based on popular sentiment or uninformed public opinion rather than good science. Such laws as the Endangered Species Act are used more as a means of stalling or stopping projects than to protect or enhance the environment.

Australia

Compared to the United States, the environmental permitting system in Australia is relatively simple. It is far from uniform, however. Each state has its own environmental protection legislation, and the approaches differ considerably from state to state. Attitudes to permitting of new mining projects may change depending on the economic circumstances and which political party is in power.

Notwithstanding the variable political climate, there is in most states at most times, a generally cooperative situation which enables proponents and regulators to work together to resolve differences. In Western

Australia, Queensland and the Northern Territory, where most of the existing and prospective mines are located, the permitting process is simple and straightforward, particularly for small, non-controversial mines in established mining areas. Such projects can be permitted in a few months and even major projects can usually be permitted in one to two years.

Another good feature of the permitting system in Australia is that proponents are encouraged to focus attention on the major environmental issues. This probably has not reduced the overall cost of environmental assessments except for small, routine projects. However, it does ensure that the major issues are studied in sufficient depth so that reliable evaluations can be made.

In some Australian states, there is no requirement for the environmental assessment to present detailed mine closure plans. Although plans for rehabilitation of waste dumps and tailings impoundments are required, there are many other aspects of mine closure that may not be addressed until closure becomes imminent.

Other shortcomings of the Australian environmental permitting processes as applied to mines, include:

- Political uncertainty - on several occasions, Australian governments have stopped projects ostensibly because of environmental concerns, even though by all normal standards the projects were environmentally acceptable.

- Confusion regarding the status of Conservation Reserves and National Parks - an ambivalent attitude exists within government whereby exploration is permitted, if not encouraged, but mining is opposed.

Issues relating to Aboriginal land rights and sacred sites overlap with environmental issues and are commonly used by environmental groups opposed to mining. It is probably fair to say that these issues cause the major concerns to proponents of mining projects in Australia.

Canada

In several ways, the situation in Canada is similar to that in Australia. The permitting system is simple compared to that of the United States. However, there are considerable differences in approaches and attitudes taken by regulators from one province to another. Also, as in Australia, there has been considerable political involvement. This is inevitable given a situation where each new project must receive approval by the Cabinet of the Provincial Government.

Another problem for proponents has been uncertainty concerning security of tenure. Changes in land status which affect proponents' tenure have occurred during the permitting process, a situation which causes mining companies to direct their attention elsewhere.

Lead time for permitting of new projects in Canada depends on size, complexity and degree of public opposition. It can vary from one year to many years.

Papua New Guinea

Papua New Guinea (PNG) is, in some respects, unique in regard to mining and the environment. Firstly, there are few if any other countries where mining constitutes such a high proportion of the gross national product. This means that there must be extreme economic pressure to approve each mining project as it is proposed. Another factor is that PNG has only a very small number of qualified environmental scientists. As a consequence, it might be expected that projects would be approved without adequate environmental safeguards. However, this does not appear to be the case. The PNG government has, when appropriate, sought the advice of international environmental experts and the proponents have applied the same technologies and levels of environmental control as they would apply in other, more closely regulated countries.

Major problems for proponents of new mines in PNG relate to difficulties in establishing land ownership boundaries and in dealing with large numbers of landowners. Conflicts with small-scale miners and law and order problems in general tend to outweigh environmental permitting difficulties.

Southeast Asia

There are many similarities and some differences among the Southeast Asian countries in which mines are being developed. In most areas that have the potential for mining, notable environmental characteristics include high rainfall, active or recently active vulcanism, high seismicity and rugged terrain. On the other hand, there are significant differences in population density, social systems, culture, land tenure, extent of vegetation clearing and agricultural development, and the availability of local labour and infrastructure to support a project. These differences occur between countries and also within the larger countries such as Indonesia.

Given the social and cultural differences it is not surprising that each Southeast Asian country is developing its own permitting system to meet its own needs. While the basic elements are the same, the detailed procedures vary considerably. Although they are becoming progressively more complex, the permitting systems are still relatively simple. There is generally a cooperative rather than an adversarial attitude on the part of regulators. Even the NGOs in Southeast Asia focus on improving environmental management rather than trying to prevent new projects from being developed.

Throughout Southeast Asia, there is a strong emphasis on social impacts and, in particular, on ensuring that local inhabitants will derive benefits from each project. Understandably, issues that can immediately affect the livelihoods of people receive more attention than more esoteric issues such as genetic diversity.

Major changes in permitting procedures have occurred in most Southeast Asian countries over the past decade and new laws and regulations are still appearing. In general, the permitting systems are becoming progressively more practicable, more logical and more efficient. There are, in the author's view, some areas where further improvements could be made. These include:

- Guidelines and standards that are clearly impractical or unachievable should be revised, as their retention results in loss of credibility for the system as a whole.

- There should be more emphasis on assessing each project on its own merits rather than applying rigid numerical standards.

- Impacts should be screened at an early stage in the assessment process, followed by in-depth study of only the important potential impacts.

- More emphasis should be placed on the methodology and quality of impact assessments with less emphasis on data collection.

Lack of funds and a shortage of experienced assessment staff are problems facing all environmental regulatory agencies in Southeast Asia. Based on experience in other countries where environmental assessment procedures have been established for longer, both these problems will decrease with time, particularly as society as a whole begins to see the benefits.

RECOMMENDATIONS

The author offers the following recommendations to those seeking to establish new environmental permitting systems for mining projects:

1. Involve the industry in the design of the permitting system and in the establishment of supporting regulations. This will have the dual benefits that standards and goals will be practical and achievable, and that the industry will be a willing partner in the process rather than a reluctant participant.

2. Establish guidelines or readily achievable minimum standards, with a recognition that more stringent standards will apply where specific circumstances warrant.

3. Base assessment on consideration of all relevant factors including:
   - Nature of project
   - Benefits of project, particularly at the local level
   - Nature of potential impacts
   - Quality of local environment
   - Assimilative capacity of local environment.

4. Clarify attitudes to mining in areas of conservation value. If mining will not be permitted in an area under any circumstances, tell the industry so that it will not waste money. If there are circumstances under which mining may be permitted, spell out these circumstances.

5. Continue to develop your own systems consistent with your own cultures and social framework. Do not borrow legislation from other countries and be sceptical of advice offered by outsiders, particularly if they have not lived and worked extensively in your country.

Summary of discussions

There was general agreement that while environmental awareness has increased dramatically, implementation and the translation of the concern into regulations have lagged behind. On the other hand, a cooperational approach is increasingly adopted when formulating regulatory policy. While it may be easier to establish constructive cooperation between government agencies and industry in countries with a large and modern mining industry, most large companies are today prepared to enter into cooperation with governments.

However, governments cannot abstain from their regulatory responsibilities and will have to provide a framework for the cooperation.

Three different approaches to improving environmental management were identified: command and control, where specific standards are prescribed: economic instruments, where market forces are the driving forces to apply solutions to environmental protection: and education and information, which aims at instilling an understanding of why environmental protection is valuable and important.

Economic instruments were seen to have the advantages of improving the efficient allocation of resources and promoting innovation, since they allow considerable flexibility in the application of mitigating measures. Several of the important environmental consequences of mining are, however, difficult to quantify and are therefore difficult to regulate using economic instruments.

The command and control approach relies on government set standards. Standards and targets may be general, applying to all operations, or tailored to the particular circumstances of the individual operation. It was noted, however, that with very large projects, governments will usually find it appropriate to formulate targets that are unique to the project. While tailoring conditions to the circumstances of individual operations offers flexibility and avoids unnecessarily demanding requirements, it also carries risk. When formulating individual conditions, regulatory agencies are open to pressure from interest groups and have to be careful to ensure that projects are treated in an equitable manner.

The importance of education and information as tools of environmental management was emphasized. With regard to small scale mining, in particular, where command and control as well as economic instruments are difficult to use, information and extension services may often yield good results. Information is also crucial in the relationship between regulatory agencies, companies and local communities, including non-governmental organizations. In the context of relations between operators and local communities, two-way communication should be established. Operators have to listen to the ones that are directly affected by their projects and they have to inform those concerned directly, without intermediaries.

Economic instruments rather than command and control were seen as most effective, but it was recognized that some mix was required for a viable regulatory program. There was concern that politics and technology driven programs were incompatible. Technical people like to make decisions on the tangible facts before them, where political decision makers often factor in more subtle and less tangible factors and perceptions. Land use decisions are inherently political because they rely on value judgements which are subjected to change as people's values change or are perceived to change. It was agreed that the two decision processes are inseparable and that both have a role in mine planning and approval.

Regulatory authority can be concentrated in a central institution or delegated to regional or local government bodies. While decentralization is often seen as desirable since regional or local authorities are better acquainted with local conditions, differences in application of legislation may evolve, creating difficulties for operators with activities in several regions. Furthermore, unless the division of authority between central and local agencies is clear and unambiguous, conflicting signals may be given to operators. Finally, local authorities often do not have the expertise necessary to implement regulations.

A number of practical conclusions and recommendations issued from the presentations and discussion of this subject:

a. Regulatory programs and requirements need to be clear and simple so that all can easily understand what is required.

b. The relationship between the regulatory agency and the industry should be cooperational rather than adversarial.

c. Regulations and requirements should be technology-driven so that they are workable. reasonable. consistent with current technology and do not lead to misallocation of resources.

d. Certainty and stability of requirements is important to maintain the confidence of investors.

e. Land-use decisions should be made so that exploration expenses do not occur on lands that are ultimately not mineable because of the land's protected status as a park. forest or unique natural. historic or cultural area.

f. Good programmes require experienced. well-trained staff who understand the intent of the requirements and the environmental impact assessment process. Inexperienced or untrained staff lengthen the process and increase cost because of uncertainty over data requirements and analysis.

g. The industry needs to be involved in the development of standards. While it is not industry's responsibility to set standards. its input and. if possible. concurrence is the best way to ensure compliance.

h. As standards are developed. rigid design standards which limit the scope for applying new solutions in site specific cases should be avoided. Standards should be performance or outcome based so that the creativity of mining companies can be used to find low cost solutions to environmental protection challenges.

i. Standards may need to be flexible and set on a case-by-case basis taking into account the carrying capacity of the area or the buffering capacity of a stream. There was concern that some mining impacts were long term if not permanent. and outcome related standards might use up the ability of an area to support other mines without degrading the area's environment.

j. Work on the important things first. Standards should focus on the things which have the largest impact on the environment and follow-up later with the nice to do items. Industry and the public wants tangible results from the investment in environmental protection.

k. Special consideration needs to be given to small and traditional miners. Their numbers are large and their impacts are great, but their resources and ability to comply with new environmental standards are limited. Education and assistance from the regulatory agency in meeting new standards are important.

SESSION II: ENVIRONMENTAL IMPACT ASSESSMENTS

Environmental impact assessment for mining: The Indian Scenario

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INTRODUCTION

Mining is one of the core sector industries playing a positive role in the process of a country's development, yet there is increasing concern over its environmental and social impacts. Today, the concern has reached such a level that often questions are posed, challenging whether a particular industry should even take shape, and mining is no exception. In recent years, mining, mining methods and its social and environmental impacts have become a matter of concern for the highest courts in the land.

Several countries, including some of the developing ones, have taken measures to mitigate the environmental and social impacts and make mining more viable and acceptable. Economic constraints, lack of skilled manpower and non-availability of proper equipment are some of the stumbling blocks preventing efficient environmental control in developing countries .

IMPACT ASSESSMENT AND THE ISSUES

The impacts of large and small scale mining operations are by now well known. Though many of the problems are site specific, most of the impact factors are common. The impact due to mining is not restricted to air, water and land only, but also affects the local population. It touches upon social issues such as health and safety of the population and the displacement of indigenous people. Restoration of mining areas is equally an important environmental liability, particularly when it comes to technical and financial implications vis-a-vis a country's other needs. The effective management of a mining operation can help to minimise or prevent environmental and social impacts.

To address all these complex interrelated issues some kind of mechanism was essential and this gave birth to the commonly used term "Environmental Impact Assessment" (EIA), which is the only technique available today to assess impacts of any such activity. Though EIA has been perfected in the developed countries, this is not the case globally. EIA helps to assess the quantitative values for environmental parameters and the impacts of the intended activity.

In India, the technique of environmental assessment has been well established. It has been extended to assess a project as a whole and is known as "Environmental Management Plan" (EMP). For a mining project an EMP includes in brief the baseline data, the mining method(s), its impacts followed by mitigation measures and the land use plan after the mining is over.

There are several methodologies available, including ad hoc procedures, outlay techniques, checklists, metrics, network and mathematical models, to assess the impacts. The use of these methodologies largely depends on the expertise and experience of the environmental consultant scientist and on the needs of the company and the government. An EIA is carried out to identify:

- Design and operations of the proposal:
- Outlay alternatives for the proposal:
- Description of the project environment:
- Identification of the environmental effects and suggestions for suitable mitigation measures.

In India. EIAs for a mining project are submitted in the form of an EMP and are judiciously scrutinised (in the case of major projects and projects involving forests) by an interdisciplinary expert committee of the Ministry of Environment & Forests. Government of India. with representation from various groups of experts including NGOs and persons concerned with environmental issues. The other representatives are specialists in ecosystem management. air and water pollution control. water resources management. flora and fauna conservation and management. land use planning. social sciences and rehabilitation. project appraisal ecology and environmental health. The committee is headed by an outstanding ecologist or environmentalist or by a technical professional. The expert committee considers the EMP report and may undertake a site visit as part of its review process. Following its deliberations. the Committee then either accepts or rejects the proposed mining activity. If approved. the project is submitted for financial and other approvals. Permission for forest clearance if forested land is involved in the project is obtained from the Ministry of Environment and Forests. Projects of a minor nature are cleared by Indian Bureau of Mines. a Government of India organisation. The project activity then goes to the implementation stage with prescribed mitigation measures. Monitoring is carried out by state and federal level pollution control boards from time to time during and after the project's implementation.

ENVIRONMENTAL STATEMENT AS PART OF AN ENVIRONMENTAL AUDIT

Environmental auditing has now become important as a means to assess the magnitude of impacts and the effectiveness of mitigation measures. It also helps to demonstrate the efficacy of pollution control techniques. environmental regulations and the level of compliance.

In India. the requirement for an Environmental Statement entered into force in 1993. The preparation of an environmental statement is based on the concept of "Environmental Audit" which is defined by the International Chamber of Commerce as a management tool consisting of a systematic documented periodic and objective evaluation of how well an organisation's management and equipment are performing with regard to the environment. An environmental audit may facilitate management control of environmental practices and help assess companies' compliance with regulatory requirements. The statements are expected to provide the following benefits to the industry:

1. Facilitating comparison and exchange of information between operations or plants.
2. Increasing employee awareness of environmental policies and responsibilities.
3. Identifying potential cost savings. including those resulting from waste minimization.
4. Assuring an adequate. up-to-date environmental database for management decision making in relation to plant modifications. new plants etc.
5. Enabling management to give credit for good environmental performance.
6. Helping to establish a professional relation with authorities by convincing them that complete and effective scrutiny is being undertaken and by informing them of the type of procedures adopted.

TECHNICAL CAPABILITIES

India was one of the first countries in the developing world to recognise the importance of environmental protection and management and has formulated and enacted several pieces of legislation concerned with environmental protection. The most recent is the notification of Environmental Impact Assessment of January 1993, which imposes restrictions and prohibitions on the expansion and modernization of any activity or new projects (including mining) being undertaken in any part of India unless environmental clearance has been accorded by the Central Government or the State Government in accordance with the procedure specified in the notification.

India has good technical manpower and educational facilities and sufficient infrastructure for preparing and reviewing EIAs. However, this is not the case in most developing countries and they also suffer from lack of financial resources to generate proper expertise and infrastructure.

CONCLUSIONS

One could conclude that, wherever there is a need for development, the relationship between the general public and local authorities should be cordial and helpful. There is a need to generate and maintain such a relationship in developing countries. The Asian/Pacific region with its mixed economy is no exception. However, the positive attitude of the general public should not be exploited so that the sustainable development itself is threatened.

There are several countries in the region which have well established environmental legislation, but lack of effective manpower, equipment and resources sometimes result in poor implementation.

To accomplish capacity building for effective management of mining operations in these countries, financial resources, skilled manpower and proper training are essential. Developing countries together with international agencies can strengthen capacities and enhance environmental awareness programmes.

Environmental impact assessment in Indonesia

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INTRODUCTION

Indonesia has adopted the principle of sustainable development in its State Policy Guidelines (GBHN). The principle is implemented through promoting balance in developing the nation and managing the environment. Act No. 4/1982 concerning Basic Provisions of Environmental Management provides the legal basis for achieving the principle of sustainable development. Act No. 4/1982 was elaborated in Government Regulation No. 29/1986 (PP 29/1986) which prescribes the use of Environmental Impact Assessment, commonly called AMDAL (an abbreviation of Analisis Mengenai Datapak Lingkungan). The process of environmental impact assessment in Indonesia includes: the Terms of Reference (Kerangka Acuen)

Environmental Impact Analysis (ANDAL), Environmental Management Plan (Ranone Pengelolaan Lingkungan, RKL) and Environmental Monitoring Plan (Rencana Pemantauan Lingkungan, RPL). The goal of AMDAL is to show whether a proposed activity is economically sound while being both environmentally and socially acceptable.

To implement PP 29/1986, the Ministry of Mines and Energy has enacted Decree No. 1158 K/008/MPE/1989 Provision for AMDAL Implementation in the Mining and Energy Sector. Since 1987, 924 AMDAL documents have been presented and approved. On 23 October 1993, the Indonesian Government released Government Regulation No 51/1993 concerning Environmental Impact Assessment to replace PP 29/1986. The aim of the new PP 51/1993 is to simplify and speed up the AMDAL process.

THE AMDAL AND ITS RELEVANT INFORMATION

AMDAL is a set of environmental impact analysis documents which consists of Terms of Reference, Environmental Impact Analysis, Environmental Management Plan and Environmental Monitoring Plan.

The purpose of the Terms of Reference (Kerangka Acuan) is to clearly identify the scope and focus of the study through the selection of relevant data and information.

The Environmental Impact Analysis (ANDAL) document's purpose is to identify the significant environmental impacts of a proposed project and to determine if these impacts can be mitigated. The Environmental Impact Analysis (ANDAL) should be comprehensive, and the impact thoroughly examined with conclusions supported by scientific evidence. The Environmental Impact Analysis should also contain a plan of action to manage the project. This information forms the basis for the Environmental Management Plan and the Environmental Monitoring Plan.

The design and operating requirement for environmental management are set out in the Environmental Management Plan. This plan contains the procedure and plan on how to mitigate negative impacts, plans for compliance with the standard, responsibilities of the proponent, as well as supervision and enforcement responsibilities of relevant institutions.

The Environmental Monitoring Plan is aimed to ensure that the mitigation of impacts is done correctly and in accordance with the Environmental Impact Analysis and the Environmental Management Plan. This document contains an examination of different types of impact, accounts of the monitoring equipment and procedures to be used, noting their accuracy and compatibility, as well as the responsibilities for conducting, analysing, reporting, managing and utilizing the results of monitoring. As in the Environmental Management Plan, the responsibilities of the proponent and relevant institutions involved in monitoring process are also included.

AMDAL PROCEDURES

AMDAL should be initiated early in the planning stages of a project. According to PP 51/1993, the Terms of Reference should be submitted first to the Central AMDAL Commission. Every Ministry in Indonesia had already established its Central AMDAL Commission. Proponents need to submit their AMDAL to the correct Commission. The Terms of Reference document has to be reviewed by the Commission within 12 working days. Sometimes a field visit is conducted to ensure that the Terms of Reference document covers all of the environmental aspects and impacts. Based on its review, the Commission decides whether an Environmental Impact Analysis is needed or not. If the project will cause significant impact to the environment, an Environmental Impact Analysis should be drafted. If the project will not have any significant affect on the environment, it only requires a Standard Operating Procedure for dealing with and mitigating environmental impacts. However, if the project will cause irreversible impact or impacts which can not be mitigated, the project is rejected. The Commission should release the directive within the 12 day time frame, or the Terms of Reference document is approved by default. The Environmental Impact Analysis, the Environmental Management Plan and the Environmental Monitoring Plan are drafted in accordance with the Terms of Reference document.

The Environmental Impact Analysis, Environmental Management Plan and Environmental Monitoring Plan are then submitted to the Commission who send the document to a Technical Team and to the AMDAL Commission at the provincial level to be reviewed before being presented in the Central AMDAL Commission meeting. The time frame for this particular stage is 45 days or the AMDAL will be approved by default. The documents can be presented as a whole or separately depending on the degree of preparation and confidence of the proponent

The Central AMDAL Commission may issue an approval of the AMDAL document after presentation. However, this is unusual. Usually the document has to be revised as a result of questions and suggestions posed at the AMDAL presentation.

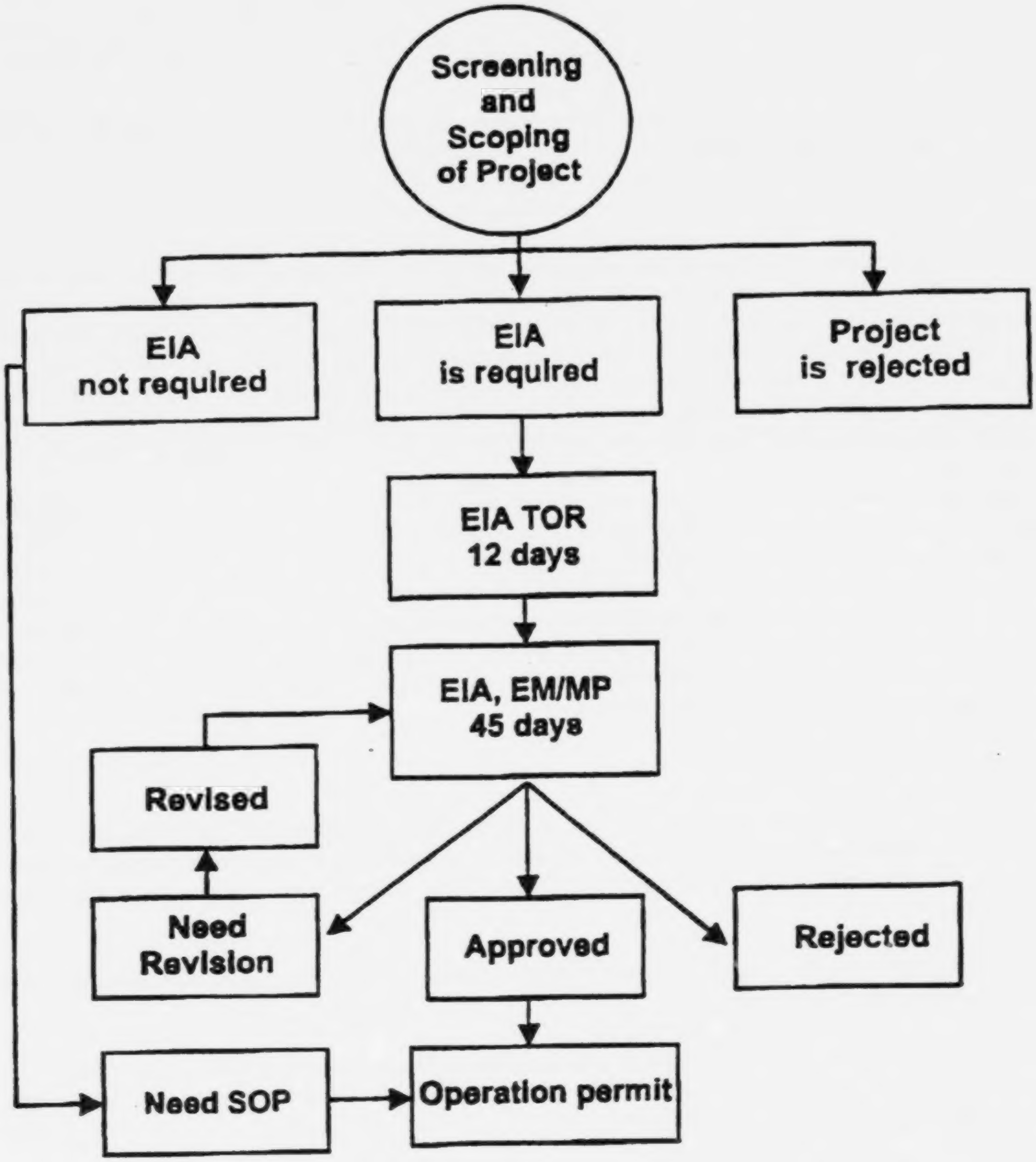
The AMDAL process is illustrated in the figure.

CHALLENGES

To support policy and strategy and to be able to enforce and monitor the implementation of the Environmental Assessment Process, human resources capabilities should be developed. This will include a training program for policy makers, mine inspectors, and employees as well as consultants who are responsible for environmental monitoring and management.

Environmental base line data is needed to facilitate the work of the AMDAL Commission and other policy makers. This information is useful for spatial zone planning and improving environmental management models. Such information is used not only to minimize land use conflicts but also to plan an integrated regional development through multiple and sequential land use, enabling the mining industry to strengthen its contribution to the sustainable economic growth of the nation.

The EIA (AMDAL) process in Indonesia


Screening and Scoping of Project
EIA not required
EIA is required
Project is rejected
EIA TOR 12 days
EIA, EM/MP 45 days
Revised
Need Revision
Approved
Rejected
Need SOP
Operation permit

The Mongolian environmental impact assessment procedures and the mining industry of Mongolia

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Mongolia

BACKGROUND

Mongolia is a relatively large, sparsely-populated country. Its land area of 1.56 million square kilometres (roughly half the size of India) supports a population of only two million people. Population density is approximately 1.3 persons per square kilometre. The climate of Mongolia is harsh. Natural ecosystems are relatively fragile, highly susceptible to degradation by human activities, and slow to recover.

Mongolia is relatively rich in mineral resources: 600 mineral deposits bearing over 80 minerals have been discovered to date. Valuable deposits include: iron, tin, copper, molybdenum, gold, silver, tungsten, zinc, lead, phosphates, tungsten, fluorspar, uranium, oil shale, semiprecious stones (agate, lapis lazuli, garnet) and coal. In addition, over 170 deposits of construction materials (marble, granite, and others) have been discovered. However, a complete country-wide geological survey has not yet been done. Of the known mineral resource deposits, 35 have been exhausted, and 90 are now under exploitation. The remainder await exploitation. Similarly, of the 190 known coal deposits, 32 are currently being mined.

The mining industry has been one of the most important sectors of the Mongolian economy during the past two decades. The mining sector is dominated by large mines such as the copper-molybdenum mine and milling operation located in Erdenet, several coal and gold mines, and the Bor Under fluorspar mining complex. However, in the last two years, exploitation of small open pit gold mines by private enterprises has intensified. There are significant implications for the environment from the expansion of the mining sector. Existing mining and ore processing operations have resulted in widespread adverse environmental effects and have placed significant demands on natural resources. It is estimated that at least 60 square kilometres of soil cover have been destroyed by coal mining operations.

Reasons for this include:

(a) The former Socialist Government did very little regarding environmental and ecological issues. Inadequate attention has been given to planning natural resource utilization, particularly mineral resources, and to the development of sustainable natural resource policies. Resource restoration and protection were also ignored.

(b) Most mining projects were implemented without appropriate environmental consideration or an environmental impact assessment study.

Given its potential to provide substantial domestic benefits and foreign exchange earnings, mining presents an important test of the ability and resolve of the new government to ensure that future economic development proceeds in an environmentally sound manner.

ENVIRONMENTAL IMPACT ASSESSMENT

Since 1987, the Ministry of Nature and Environment (MNE) has used the Ecological Expertise Procedure (EEP) to carry out environmental reviews of projects. This procedure includes an ecological review and assessment of proposed projects, provides recommendations for changes, and denies or approves the project. Environmental Impact Assessments and the Ecological Expertise Procedures differ in several ways:

(a) The EIA reviews the positive and negative impacts of projects at an early stage in project planning, prior to project design;

(b) If the project's impacts cannot be minimized through mitigating measures, the EIA procedure requires further studies to consider alternatives to the suggested project design, management and implementation that will minimize the project's negative environmental impacts;

(c) The EIA provides opportunity for the public to comment and provide recommendations on the project and its proposed impacts;

(d) The MNE reviews projects yearly. Projects observing MNE conditions are allowed to continue operations. The MNE may suspend approval to projects not adhering to the laws.

In 1993, a one year Asian Development Bank Technical Assistance project designed to strengthen environmental impact assessments in Mongolia was introduced. This project replaced the Ministry of Nature and Environment's Ecological Expertise Review Procedure with a Mongolian Environmental Impact Assessment Procedure (MEIAP).

Under the new MEIAP, proposed projects and modifications to existing projects are screened to identify any environmental impacts. Depending on the severity and type of environmental impacts, the screened projects may require:

(a) The completion of a detailed environmental impact study that focuses on all environmental sectors;

(b) The completion of an environmental impact assessment study that focuses on a few environmental sectors;

(c) The implementation of mitigation measures and compensation that will decrease the environmental impact to an acceptable level.

In June 1994, the Government of Mongolia passed an Environmental Impact Assessment Regulation which provides the legal basis for the new Mongolian Environmental Impact Assessment Procedure.

MINING LEGISLATION

Mining is regulated by the Mining and Minerals Law (1988) and the Land Use Law (1979). Key provisions of these laws are:

- Land resources and mineral resources are state property;

- Licensing and permitting requirements for prospecting and exploration for minerals are issued by the Government.

The environmental obligations are formulated in general terms. such as rehabilitation activities. However. all laws are currently under revision. and the latest draft of Mining Laws includes more specific environmental obligations such as requirements for Environmental Impact Assessment of mining projects and the establishment of rehabilitation funds.

At present. as a remedial measure. the State normally incorporates terms and conditions in the mining lease. although this is not mandatory under the existing mining law (see figure).

ENVIRONMENTAL IMPACT ASSESSMENT FOR MINING PROJECTS

According to Government Regulation No. 121/1994. all mining projects are subject to an Environmental Impact Assessment Study.

The screening criteria of MEIAP require:

(a) A full Environmental Impact Assessment for large mining projects or quarries (over 300 hectares or ground operation):

(b) A focused Environmental Impact Assessment for medium scale mining projects (over 200 hectares):

(c) Mitigative Negative Declaration for small mining projects (up to 100 hectares).

Usually. the national authority responsible for the screening must conduct a Preliminary Assessment and issue screening criteria for proposed mining projects using additional environmental criteria such as the baseline condition of mining site and type of processing technology.

Key issues of Environmental Impact Assessment of mining projects in Mongolian conditions include:

(a) The need for additional investigation of baseline conditions of mining sites because of the shortage of information on the whole country:

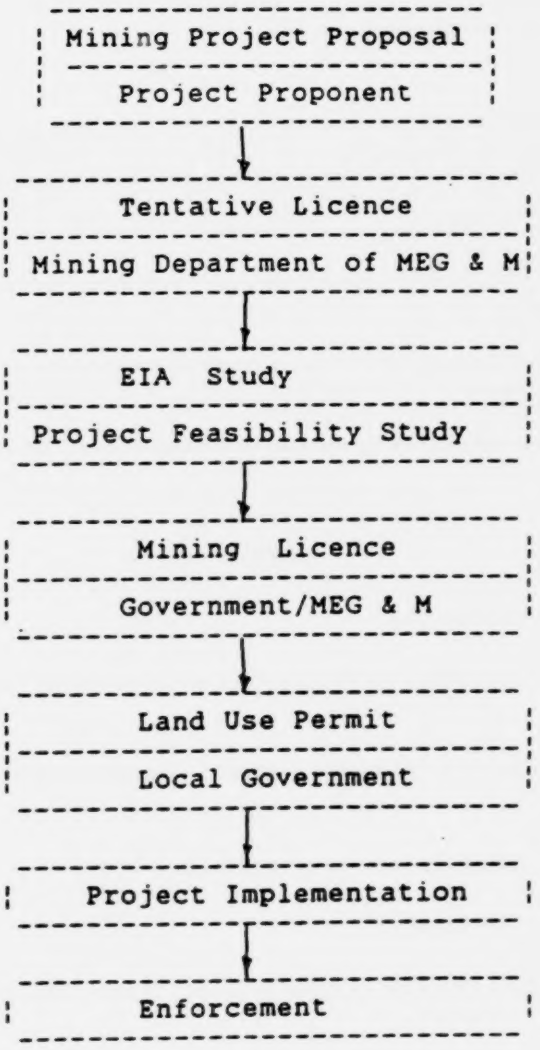
(b) The impact on water resources. because of problems caused by the scarcity of surface water resources in the eastern and southern parts of the country and drainage problems in the northern part:

(c) The need for proper plans for biological and technical reclamation given the harsh climate and the characteristic light soil with low fertility;

(d) The need for special attention to hazardous waste handling due to lack of experience:

(e) The strong requirement for project specific Monitoring Programme Development.

Regulatory steps for a mining project in Mongolia


Mining Project Proposal
Project Proponent
Tentative Licence
Mining Department of MEG & M
EIA Study
Project Feasibility Study
Mining Licence
Government/MEG & M
Land Use Permit
Local Government
Project Implementation
Enforcement

* MEG & M - Ministry of Energy, Geology and Mining of Mongolia

CASE STUDY OF ENVIRONMENTAL IMPACT OF THE ZAAMAR GOLD DEPOSIT

In 1992. a "Gold Programme" was adopted. Its purpose is to increase the annual gold production capacity seven times by 1996 through the exploitation of known. open-pit gold mines. In 1992-1994. 59 medium and small-scale gold mining projects were implemented. Twenty of those projects were implemented in the Zaamar gold deposit area. in a 150 square kilometres region in the valley of the river Tuul. Total commercial gold reserves are estimated to be about 46 tons. The infrastructure is relatively well developed. and the existing land use is open pasture. The main adverse impacts on the environment include loss of soil fertility and erosion. increased pollution of surface water and changes in the flow regime of the river and groundwater table. and impacts on the river environment and downstream water users. All projects were reviewed and Mitigative Negative Declarations were issued separately. The possibility of cumulative impacts was studied and a general investigation of soil and vegetation for the whole area was carried out. Table 1 shows the environmental impact assessment procedures used.

Table 1 The Environmental Impact Assessment of Gold projects in the Zaamar Gold Deposit Area

EIA Requirement	Number of Projects	Remarks
Focused EIA	1	Implemented in 1994
Mitigative Negative Declaration	17	Projects Implemented 1992-1994
Ecological Expertise Procedure	2	Projects Implemented in 1980's

CONCLUSIONS

The following actions are needed:

(a) To develop an Environmental Management Plan and Monitoring Programme for the whole gold deposit area;

(b) To establish a fund for environmental protection measures consisting of a percentage amount of the whole project cost;

(c) To use economic incentives in environmental management;

(d) To develop source standards; and

(e) To revise and make appropriate changes in project development procedures

Environmental policies for the mining industry in Malaysia

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INTRODUCTION

Malaysia has a long history of mining and the mining industry has played a major role in the development of the nation, especially during the 1960s and 1970s. Important commercial centres such as Kuala Lumpur, Ipoh, Seremban and many others can trace their origins to tin mining. The country's rich tin resources have provided a steady source of income, foreign exchange and employment opportunities. In short, the industry has contributed significantly to the progress of the nation. While the mineral sector's contribution to the economy has now declined substantially, the country's rich mineral endowment still offers an excellent future for the industry.

THE NATIONAL MINERALS POLICY

To encourage the further development and diversification of the nation's mineral industry, a major review of the regulatory and fiscal system for the mineral sector was undertaken in 1989. With the participation of UNDP experts and Federal and State Government representatives, the Mineral Development Policy and Planning Project (MDPP) was established with a view to formulating the National Mineral Policy and a comprehensive set of harmonised models of legislation which would provide the necessary incentives for increased investment in the mineral sector.

The National Mineral Policy provides the foundation for the development of an effective, efficient and competitive regulatory environment for the mineral sector. Whilst the thrust of the policy is to expand and diversify the mineral sector through optimum exploration, exploitation and utilization of Malaysia's resources, maximum use of research and development and modern technology, emphasis is also given to environmental protection and sustainable development as well as to the management of social impacts.

OVERALL ENVIRONMENTAL CONSIDERATIONS

Malaysia's overall policy on environmental protection is best reflected in a statement from the Third Malaysia Plan 1976-1980: "The ultimate aim of the Federal Government, working in close cooperation with the State Governments, is to ensure as far as possible that all man's activities are in balance with his environment."

MINING IN MALAYSIA

The mining industry in Malaysia currently includes tin mining, gold from surface mining operations or as a byproduct of other mining operations, bauxite mining, copper mining, iron ore mining, and extraction of industrial minerals, including barite, kaolin, clay, silica sand, limestone and dimension stone. Mining activities in Malaysia are exclusively by means of surface operations, including quarries and alluvial deposits. Tin mining is still predominant with alluvial dredging, lode mining or open pit mining.

MINING AND THE ENVIRONMENT

The National Mineral Policy accepts that mining activities are exploitative and destructive in nature, and thus have the potential for significant impact on the environment. From Malaysia's past experience with the alluvial mining industry, negative impacts of mining have been identified. These include disruption to the land surface and the ecosystem as well as radical changes to existing social patterns and to aquatic systems, particularly if the site contains acid generating material.

On the positive side, mining projects can also provide tremendous economic and social benefits to the nation and society, including long term economic and employment benefits, enhancement of infrastructure facilities, improvement of social and health benefits to the mine region, growth of secondary and related industries and services, provision of needed resources and enhancement of technical skills and education levels. The mining industry is strategic at a certain point in time and it also provides inputs for industrial development. The mining industry will continue to be promoted in Malaysia. Malaysia's policy makers believe that the negative impact of mining can be mitigated with proper planning, incentives, supervision and control.

LEGAL AND ADMINISTRATIVE FRAMEWORK FOR ENVIRONMENTAL PROTECTION AND REHABILITATION.

Environmental Impact Assessment

In Malaysia, the Department of Environment (DOE) under the Ministry of Science, Technology and Environment plays the lead role in environmental protection. The Environmental Quality Act 1974 and its regulations are the principal regulatory instruments for environmental protection. In 1986, the Act was amended to include Section 34A, a formal requirement for an EIA for various prescribed activities under the Act. The amendment is described as the Environmental Quality Act (Prescribed Activities) (Environmental Impact Assessment) Order 1987 and has been in force since April 1988. For the prescribed activities an EIA report has to be submitted to the Director General of the DOE for approval before construction can commence. Activities pertaining to mines and quarries included in the prescribed activities are as follows:

(a) Mining of minerals in new areas where the mining lease covers a total area in excess of 250 hectares

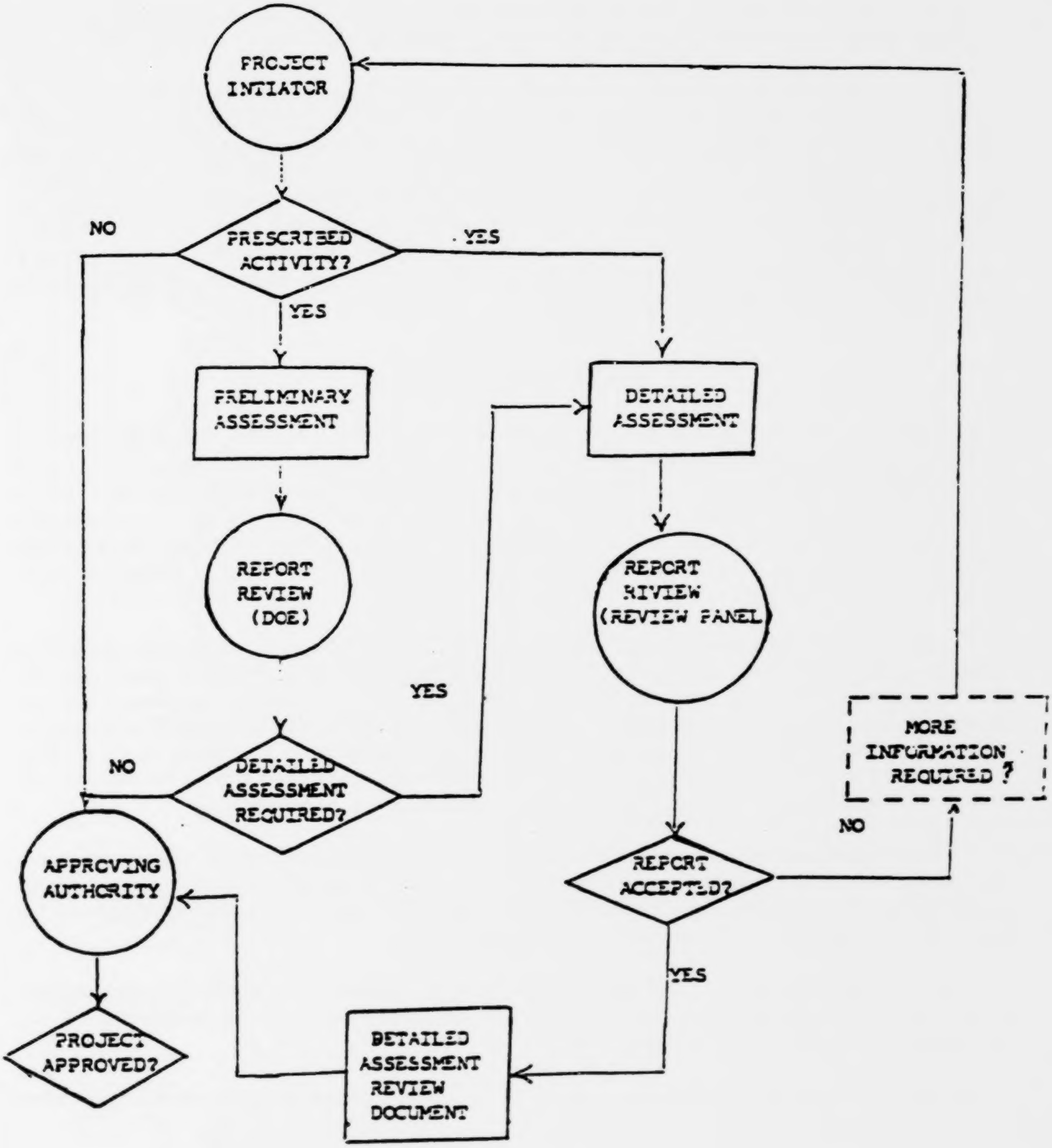
(b) Ore processing, including concentrating for aluminum, copper, gold or tantalum.

(c) Sand dredging involving an area of 50 hectares or more.

(d) Quarrying of aggregates, limestone, silica quartzite, sandstone, marble and decorative building stone within three kilometres of any existing residential, commercial or industrial area, or any area for which a license, permit or approval has been granted for residential, commercial or industrial development.

The EIA procedure is presented diagrammatically in the figure. The procedure provides for two levels of assessment: first a preliminary assessment which is reviewed by DOE staff, and then a detailed assessment which is reviewed by a panel of specialists from government, academia and others. By the end of 1993, 14 mines and 100 quarry projects had been subjected to the EIA process. All of these were preliminary assessments. The EIA procedure has been developed to achieve the following:

EIA procedure in Malaysia


PROJECT INTIATOR
PRESCRIBED ACTIVITY?
NO
YES
YES
PRELIMINARY ASSESSMENT
DETAILED ASSESSMENT
REPORT REVIEW (DOE)
REPORT RIVIEW (REVIEW PANEL
YES
NO
DETAILED ASSESSMENT REQUIRED?
MORE INFORMATION REQUIRED ?
NO
APPROVING AUTHORITY
REPORT ACCEPTED?
YES
PROJECT APPROVED?
DETAILED ASSESSMENT REVIEW DOCUMENT

(a) To allow the proponent, the Government and the public to identify potential environmental issues relating to the development, production and post-production stages of the project:

(b) To incorporate the appropriate mitigating measures for protection of the environment at all stages of the project into project planning and design:

(c) To allow the Government to specify appropriate operational and reclamation procedures, including design, operational practices, monitoring and reporting procedures.

Though the legal requirements and procedures for EIA are already in place, detailed guidelines, regulations and standards have not yet been developed for the mining sector. Realising the need for such guidelines and regulations, the Ministry of Primary Industries, which is responsible for mineral development, together with the Mines Department and the DOE, is currently implementing a project entitled "Mineral Sector Safety, Environmental Protection and Rehabilitation" which includes the preparation of guidelines and regulations on EIA for mines and quarries. This UNDP-sponsored project is to complement other legal and regulatory frameworks that have already been finalised to achieve the objective of the Mineral Policy in providing Malaysia with an effective, efficient and competitive environment for greater investment in the mining industry. The project is expected to be completed by the end of 1994.

MINE REHABILITATION

Rehabilitation of mined lands is the concurrent responsibility of the State and Federal governments. Though many ex-mining lands have been successfully redeveloped into housing and business centres or used for other economic activities such as agriculture, aquaculture and tourism related projects, many more are left idle and have become eyesores. In the past, efforts at mining land rehabilitation were haphazard. Responsibilities with respect to mining land rehabilitation were not clear, as there was no uniform regulatory approach to rehabilitation. Most State mining laws did not address this issue. Owners of mining lease were not interested in rehabilitating mining lands as they had to relinquish the land after expiry of the lease.

To overcome these shortcomings, the proposed model State Mineral Enactment, which is one of the main outcomes of the MDPP project, included provisions requiring large-scale mining projects to submit plans for mine rehabilitation. The mine rehabilitation plan shall provide for the specific rehabilitation actions, inspections, annual reports, estimated total cost of rehabilitation, cost estimates for each specific rehabilitation action and a detailed timetable for the orderly and efficient rehabilitation of the mining land. A Mine Rehabilitation Fund will be established, whereby the lessee shall make annual payments into the fund to cover the cost of rehabilitation in accordance with the mine rehabilitation plan submitted.

For mining leases authorising small-scale operations, a Common Rehabilitation Fund will be established, whereby the lessee shall pay annually a prescribed fee for the purpose of rehabilitation and to enable the State to take any remedial measures to minimise the destructive effect of mining and revitalise ex-mining lands for beneficial use. Part of the Fund may come from the State.

The UNDP-sponsored project noted above will look into the preparations of guidelines and regulations on mining land rehabilitation. The financial requirements mentioned above mean that the guidelines would be prepared on the basis of the following principles:

(a) The cost of ming land rehabilitation (especially for large-scale operations) is to be borne by the mine operator or the holder of the mining lease. The rehabilitation should:

(i) Revitalise used mining land for other beneficial use:
(ii) Ensure safety to subsequent users of the area:
(iii) Be environmentally friendly and stable:
(iv) Be self sustaining.

(b) The rehabilitation plan of a mine should form an integral part of the project planning phase and should be part of the review and approval process.

(c) The cost of rehabilitation should be internalised into project operating costs.

(d) On-going progressive rehabilitation should be encouraged.

(e) The risk of public expense being incurred as a result of premature closure, or of nonfulfillment of the accepted rehabilitation plan, should be minimised by means of a rehabilitation bond.

CONCLUSIONS

Malaysia's mining industry is on the verge of transition. Alluvial tin mining has become a blessing of the past. Under the New Mineral Policy, the thrust would be towards non-alluvial mining of minerals other than tin. The shift in emphasis would also mean that the legal framework must be adjusted to keep abreast of changing times. Global concern for the environment necessitates an updated and transparent set of rules and regulations establishing clear obligations for investors in respect of environmental control and mining land rehabilitation. However, it is also important that the guidelines and regulations do not appear to be too stringent so as to become a disincentive for investors.

Summary of discussions

It was generally agreed that the Environmental Impact Assessment (EIA) is the main instrument used by governments to assure that environmental management in companies is in conformity with society's environmental objectives. It helps to assess the quantitative value of the environmental parameters and of the impacts. The EIA is and should be an evolving mechanism. As requirements are more clearly understood, as technology changes and both companies and regulatory agencies acquire experience, the context and scope of EIAs change. The EIA is not an exercise that is undertaken once and for all. It needs to be followed up by monitoring and audits and may need to be repeated and reviewed at regular intervals.

It was noted that the EIA preparation and approval process is often costly and time consuming. Some of the delays may occur because the requirements are not perfectly understood by operators. Governments may, however, find it possible to reduce the time and expense devoted to EIAs without compromising the objectives by concentrating on the major issues and abstaining from the inclusion of all theoretically possible problems, and by allowing different levels of ambition in EIAs depending on the size of projects. In many countries it is possible to waive the EIA requirement for small projects.

EIAs are commonly prepared by independent third parties. In order to assure that EIAs conform to minimum quality standards. some countries have introduced certification of consultants preparing EIAs. Generally. the applicant pays for the preparation of the EIA. but not for the costs incurred by the government due to the approval process. Cost sharing arrangements. whereby applicants assume some of the government's costs. may contribute to reduced lead times and greater efficiency. but could. on the other hand. lead to regulatory agencies becoming financially dependent on companies. an outcome which would hurt their credibility.

The importance of public participation in the EIA process and public access to information was emphasized and it was noted that these features are part of government policy in many countries. The practical modalities of assuring public participation vary from country to country. but governments are increasingly aware of the contribution that public participation has to make to the EIA process.

It was stressed that. from the point of view of operators. mining cannot focus on economics alone but must incorporate environmental protection measures. An Environmental Management plan is therefore central to all mining operations. The Environmental Management Plan needs to be a corporate ethic and not a plan that is forced on companies by government regulatory bodies.

SESSION III: REHABILITATION OF MINING SITES

Rehabilitation of mining sites in P.T. Koba Tin

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P.T. Koba Tin
Indonesia

INTRODUCTION

Economic growth in Indonesia has been accompanied by technological advancement and increasing environmental awareness. This paper describes how Koba Tin has sought to maintain its position as one of the world's lowest unit cost producers of tin while simultaneously recognising its responsibility to minimise the impact of its mining activities on the environment. Environmental controls and the reclamation of mining land are an integral part of P.T.Koba operations. Water quality is protected by the installation before operations commence and through a closed system for mine water during operation. Only excess rainwater and ground water are discharged into rivers. Reclamation of mining land is facilitated during operations by procedures such as timber conservation, top soil conservation and the use of the backfill process. The backfill process ensures that a greater part of the mined-out area will be covered with overburden in preparation for reclamation.

Koba Tin operates twelve gravel pump mines and a large capacity bucket ladder dredge on its contract of work area on Bangka Island in South East Sumatera, producing approximately 7,500 tonnes of tin per annum.

CHARACTERISTICS OF MINED-OUT AREAS

Mined-out areas generally consist of tailings dumps, overburden heaps, compacted soils and lakes (kolongs).

Overburden dumps and slime retention areas have chemical properties that are similar to the original soils. Overburden is extremely heterogeneous because during dumping it is difficult to separate materials from various depths of excavation. Wet slime is in the form of pulp, while dry slime is hard and broken in pieces. Slime is deposited in the primary settling pond as a result of the leaching process, and it usually carries grass seeds. When the slime in the primary settling pond gradually dries out, natural succession will progress rapidly. Compacted soil occurs as a result of compaction by earth moving equipment. The compact nature of the soil makes it difficult for plant roots to penetrate, thus hindering plant growth. Lakes or kalongs result from the flooding of sections of the mine which are not backfilled. The water in the abandoned kalongs varies in depth, depending on the levels of ore extraction and the volumes of backfilling. The main constraint to fish culture in the kalongs is the acidity of the water. In kalongs with low pH levels the possibility of aqua-culture is limited.

RECLAMATION ACTIVITIES

P.T. Koba Tin commenced reclamation activities in 1976 by conducting experimental works on soil management and species selection.

The concession area is mainly located in forest, and land reclamation is directed primarily at reforestation by accelerating and supporting natural plant succession. Reclamation activities are based on past reclamation trials and improvement of procedures is based on experience. Throughout the programme, Koba Tin has sought advice and assistance from relevant government authorities such as the Department of Forests and the Fishery Directorate General. Local knowledge and experience is also obtained through the employment of farmers and contractors to undertake planting programmes.

Reclamation starts with levelling, which re-establishes a relatively flat surface in order to minimise erosion by water and provide easy access for maintenance. Overburden and tailing dumps are contoured using a bulldozer until a surface with a maximum slope of approximately 30 degrees is established.

The physical properties of the soil are improved by deep ripping of compacted soils and overburden surfaces to a depth of 60 centimetres using a ripper bulldozer. In loose soils, air and water penetration will aid root growth.

The chemical properties of the soil are improved by the addition of lime to reduce acidity. With the reduced level of acidity, the soil will allow more plant species to grow, thus accelerating natural succession. Lime is also applied to control toxic heavy metals in solution. Inorganic fertilisers are applied to increase nutrients in the soil. Phosphates have the capacity to deposit some heavy metals as complex compounds, especially copper, aluminium, selenium, zinc and lead. Organic fertilisers are applied to produce stable metal chelates. Metal ions are bound between the atoms of organic molecules, so toxicity does not occur until the molecules break down naturally.

Natural vegetation provides organic matter to the soil so that toxic metals are less likely to dissociate from the stable chelate associations.

Selection of plant species for revegetation is based on the following considerations:

- Easy to obtain
- Able to live on the subject land
- Rapid growth rate leading to good ground cover
- Responsive to fertilisation
- Insect/disease resistance.

Based on the capacity to stabilize soil surface, the planted vegetation can be categorized into three groups

(a) Primary vegetation
(b) Secondary vegetation
(c) Tertiary vegetation

The primary vegetation consists of green manure vegetation species, such as creeping plants and shrubs. Besides acting as a surface covering, these species also improve the nitrogen content in the soil, as nodules on the roots of the plants contain bacteria that are able to bind free nitrogen from air. The species used are:

- - *Calopogonium caerolium*,
- - *Calopogonium mucunoides*,
- - *Centrocema pubescens*,
- - *Pueraria javanica*,
- - *Crotalaria anayroides*,
- - *Crotalaria juncea*,
- - *Crotalaria usaramoensis*,
- - *Flemingia congesta*,
- - *Tephrosia vogelii*.

The secondary vegetation planted is partly composed of the green manure vegetation species. The species belonging to this group are:

- - *Melastoma polyanthum*,
- - *Rhodomyrtus tomentosa*,
- - *Leucaena glauca*,
- - *Calliandra callothyrsus*,
- - *Sesbania grandiflora*.

The last three species form green manure.

The tertiary vegetation plants are selected from the following species:

- - *Acacia auriculiformis*,
- - *Acacia mangium*,
- - *Anacardium occidentale*,
- - *Albizzia falcata*,
- - *Eucalyptus deglupta*,
- - *Syzigium spp*,
- - *Alstonia scholaris*,
- - *Eucalyptus urophylla*,
- - *Melaleuca leucadendron*,
- - *Schima walichii*.

In addition, banana and pineapple trees are planted in areas with relatively thick soils.

The selection of tree species used in a given area depends on the soil type. Some examples are: *Sengons*, which are planted in dry humic soils, *Eucalyptus urophylla*, which is suitable for reclamation of muddy areas, and *Acacias*, which are planted in dry tailings areas and along road sides.

MAINTENANCE

Maintenance of the reclaimed areas continues until the plants are well established, which usually occurs within two years. The activity includes weeding, fertilisation, and insect/disease control as well as replacement of dead plants. Weeding is undertaken to avoid competition between weeds and young plants for nutrients. Weeding is carried out selectively, since loose and open soils are subject to erosion and excessive evaporation. Fertilisation prior to planting is undertaken by the application of approximately 50 kg/hectare of NPK fertilizer. This is sufficient to support plant growth. For growing young plants, a mixture of urea, TSP and KCL fertilizers at 100 kg/ha^{-1} is applied. Application of NPK 15: 15: 15 compound fertilizers at 150 kg/ha^{-1} in tailings areas provides satisfactory plant growth. Fertilisation is undertaken two or three times per year. Pest and disease eradication is only conducted for seedlings and young plants. Careful selection of plant species reduces pest and disease control work. Dead tree replacement is carried out until the plants reach the age of one year. Dead trees are replaced by seedlings or cuttings. After one year, dead trees are no longer replaced, since the canopies of the growing trees will shade the area from sunlight and preclude further planting.

RECLAMATION RESULTS

By April 1994, the area reclaimed totalled 1,445 hectares, the majority of which had been planted with *Sengon* and *Acacia* trees. *Sengon* trees are particularly suitable for humic and lateritic areas. At the age of 16 months, they generally attain a height of four metres and have an average crown diameter of two or three metres. Acacias reach a height of three or four metres and have an average crown diameter of 2.6 metres.

CONCLUSION

In establishing a reclamation and environment protection program as an integral part of its mining operation, Koba Tin has sought to increase the awareness of all employees of the importance of care for their surroundings. Much work remains to be done. Nevertheless, by making an annual commitment the company intends to meet its obligations in a systematic and organised manner, without the requirement for massive funding at the conclusion of mining activity.

Rehabilitation of mining sites

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The mining and mineral processing industry has been a major land user in Australia since soon after European settlement. The industry recognises that mining activities will cause some kind of impact on the environment, but argues that in the balance of advantages and disadvantages these impacts are significantly offset by the benefits that result from the production of mineral products. In the past there was no stipulation that required miners to restore the environment, although in many cases simple clean-up operations were carried out on completion of projects. Today, standards for adequate rehabilitation of disturbed lands are set by the community and ensured by legislation and "codes of practice".

THE REHABILITATION OBJECTIVE

Mining is only a temporary land use and a clear rehabilitation objective consistent with the projected future land use of the area must be defined. Good planning and operations procedures will minimise the adverse impacts of the mining operation. Rehabilitation refers to the processes whereby unavoidable impacts on the environment are repaired.

MINIMUM ENVIRONMENTAL STANDARDS FOR EXISTING MINES

There is a wide expectation by industry, government and the community that mining operations must be conducted in complete accordance with appropriate environmental safeguards, and that mine sites will be rehabilitated at the completion of the operation.

Environmental standards for existing mines are set by a variety of mechanisms. For all operations there are the over-riding standards for air, water, dust, and noise emissions laid down in the relevant Environmental Protection legislation.

In addition to these general requirements, there are also the specific requirements laid down by the State Departments which have responsibility for the mining industry. These are usually contained in conditions of title attached to mining tenements. Where operations do fall under the aegis of the Department of Mines, lease conditions must be framed to require adherence to an agreed framework of rehabilitation and environmental management principles.

Throughout Australia, there are, however, a small number of mines that have been operating since times when the public's perception of the nexus between development and the environment was not as developed as it is today. Some operate under special Acts of Parliament, others are old operations which were set up with environmental requirements which are inadequate by today's standards.

In many cases, it is not possible, for economic or technical reasons, for these mines to be brought up to full compliance with current standards. However, any extension to the area already disturbed cannot be tolerated and a minimum requirement must be that all extensions to operations fully comply with current standards.

EXISTING STANDARDS

All States impose environmental standards principally through lease conditions. However, the ability to vary lease conditions to reflect current thinking on minimum standards varies from State to State. If appropriate standards are to be applied to all mines, then the power to vary conditions is a prerequisite.

Minimum standards may court the danger of bringing all operations down to the lowest common denominator, and a detailed prescriptive approach as followed in the United States is not favoured by the mining industry. It is far more effective to set processes in place rather than rely purely on prescriptive measures. To maintain flexibility and the ability to adequately address site specific problems, the recommended process is that all mines should be managed in compliance with an Environmental Management Plan developed in association with the appropriate Department of Mines or relevant authority.

To encourage proper mining, rehabilitation and environmental management, lease holders should be required by a condition of their title to prepare and submit a detailed management plan. Part of this plan should involve regular periodic reporting and the ability to review as appropriate during the mine life.

Detailed guidelines, which specify each issue that must be addressed by each mine operator, should result in a uniform standard of management plans and may well afford better environmental protection and be fairer to the mining industry as a whole.

Effective environmental regulation requires a single lead agency associated with the mining industry and with the specialist knowledge required. A one-stop-shop to minimise bureaucratic duplication of functions, without requiring abrogation of any government agency functions, is highly desirable.

Departments of Mines should freely share information on rehabilitation and environmental control. Free exchange of information and the ability to make use of any published material or educational material can only increase the effectiveness of environmental management in the mining industry.

PRINCIPLES OF ENVIRONMENTAL MANAGEMENT

The general principles leading to sound environmental management and effective rehabilitation have been developed by State Governments, the mining industry and the Australian Mining Industry Council incorporating relevant ideas from other national codes and Australian Standards.

These principles are:

(a) Prepare a plan of the proposed rehabilitation program prior to the commencement of mining:

(b) Incorporate stable landform configurations and a self-sustaining vegetative cover of a type appropriate to the selected post-mining land-use as an integral part of the progressive rehabilitation process:

(c) Ensure that the site is made safe:

(d) Remove and retain top soil for subsequent rehabilitation where practicable and respread cleared vegetation on remedial areas:

(e) Be aware of any statutory requirements and ensure that these are met in the plan:

(f) To the extent practicable, reinstate natural drainage patterns where they have been altered or impaired:

(g) Remove or control residual toxic materials. Identify potentially toxic overburden or exposed strata and screen with suitable material to prevent mobilisation of toxins:

(h) Ensure the reshaped land is formed so as to be inherently stable, adequately drained and suitable for the desired long term land use:

(i) Minimise the long term visual impact by creating land forms which are compatible with the adjacent landscape:

(j) Minimise erosion by wind and water both during and following the process of reclamation:

(k) When mining is complete, remove all facilities and equipment from the site unless approval has been obtained from the regulatory authorities or affected land holders to do otherwise. There may be occasions when post mining tourism or heritage values require consideration:

(l) Compacted surfaces should be deep ripped to relieve compaction unless subsurface conditions dictate otherwise:

(m) Provided it is consistent with post mining land use, revegetate the area with plant species that will control erosion, provide vegetative diversity and will, through succession, contribute to a stable and compatible ecosystem:

(n) Prevent the introduction of noxious weeds and pests:

(o) Monitor and manage rehabilitated areas until they are self sustaining or at an end point satisfactory to the landowner. or the government instrumentality responsible for the land.

REHABILITATION OF MINING SITES

- Revegetation with local species is usually seen as the most desirable rehabilitation objective in non-agricultural and non-urban areas. However. rehabilitation for other post-mining land uses may be equally appropriate in particular settings. These include revegetation with pastoral. agricultural or forestry species. industrial or urban development. development of recreational facilities. and water storage or waste disposal in final voids. Proposals for post mining land use should have due regard to the concerns and interests of local land users and occupiers.

- Rehabilitation must be directed towards the post-mining land use agreed with the regulatory authorities and the local landowners or community. Rehabilitation must be directed towards achieving a stable land form and a self sustaining vegetative cover of a type appropriate to the selected post-mining land use.

- The Management Plan must contain schedules detailing proposed progressive rehabilitation. The reports made against the Plan should include details of progress made. The Management Plan should set out the steps that will be taken to restore flora or to re-establish faunal habitat destroyed by mining operations. Departmental guidelines on rehabilitation should make clear what standards of baseline data collection are required as well as standards by which restoration will be evaluated.

- Topsoil should be separately stripped ahead of operations. If possible. this topsoil should then be respread immediately over the areas of the lease undergoing rehabilitation. so as to maximise the viability of seeds and other propagules. Where it is necessary to store topsoil. stockpiles should be low mounds and stabilised to ensure the longevity of the propagules and to minimise erosion.

- Characterisation of waste materials to be used in soil profiles should be undertaken to determine their suitability for use either as a soil replacement or extender or for substrate purposes. so as to ensure the long term viability of revegetation.

- Trials of floral species together with soil and waste rock types chosen for rehabilitation should be started early in the mine life.

- Compacted areas should be ripped prior to rehabilitation.

- Controls should be adopted to prevent the introduction of weeds and other floral and faunal pest species into areas undergoing rehabilitation or the mine site in general.

- Protection or improvement of the visual amenity of the site is to be a consideration at all stages of mining and as a final rehabilitation objective.

- Prior to the demolition or removal of surface infrastructure or facilities at the close of operations. possible later uses should be considered. It may be appropriate to retain some facilities. such as those compatible with the post mining land use or those having heritage value. after the cessation of mining.

- Where feasible. rehabilitation or re-treatment of any derelict prior mining. and tailings or waste dumps within the area of the lease should be considered.

APPENDIX

This appendix is taken from a draft version of a paper prepared after the 35th ***Conference*** *of Chief Inspectors of Mines held in Darwin in November 1993.*

Security Deposit Systems

The Final Report of the Ecologically Sustainable Development Working Groups stated that "rehabilitation bonds and bank guarantees are now well established tools that are intended to provide a financial incentive for proper completion of rehabilitation work".

In all Australian States, companies holding mining tenements under the Mining Act applying in that State are required to lodge security bonds, or similar financial instruments, to ensure that the cost of rehabilitation of mine sites will be met by the miner rather than through public funding.

The title holder is required to lodge this security or guarantee to ensure compliance with lease conditions, principally those relating to rehabilitation. Such security deposits are to be held until rehabilitation has been carried out to the satisfaction of the Department. In the event of a title holder refusing to meet his obligations, the Department will then arrange for the rehabilitation to be completed and the security deposit will be forfeited to the extent necessary to complete the remedial works.

In order to ensure that all land disturbed by mining is satisfactorily rehabilitated, there is therefore a need to set a security for all mining and exploration titles. This security must be adequately high so that the financial risk to the Government of a leaseholder default is minimal, while making allowance for progressive changes to rehabilitation requirements and taking all historical aspects into account.

Existing Systems and Method of Operation

All Australian States already have a requirement for a security to be lodged against possible failure by the lease holder to meet his environmental responsibilities. However, there are significant differences between States on the method of calculation of security levels, the periodic review of securities, and the degree of risk assumed by the Government.

Recommended Framework

It is desirable that, to the greatest extent practicable, the requirements imposed on the mining industry do not have great variations between States.

For optimal effectiveness, it is recommended that each State's security system incorporate the following factors:

Statutory Imposition

There must be a requirement for a security to be lodged with the appropriate State Department.

Security Deposit Framework

The amount held under a security must be based upon the cost to the Department to complete full rehabilitation of a disturbed site. It is not disputed that this will be higher than the cost to the titleholder, but in the event of a company failure or default the Government agency will not be able to avail itself of the existing on site mine production equipment and staff and resultant marginal costing.

Mining legislation in each State should also authorise the seizure of equipment where there has been a breach of the Act or lease conditions. In the case of illegal mining where no security exists, this would enable the Department to rectify the damage in preference to the Crown having to assume liability.

Assessment Procedures

In the event of a new mining title being granted, the security required to be lodged must be sufficient to adequately rehabilitate all disturbance proposed up until the first review period.

A sudden increase in a security for a mine that has previously had only a nominal deposit may place an undue financial burden on the operator, particularly in the case of a small operator. In these cases, the security should be increased incrementally, in parallel with incentives to the operator to reduce the disturbed area. It may be preferable to retain the mine in operation, with the operator progressively ameliorating the past effects of mining, rather than to put the operation into liquidation and having the State assume the (largely unfunded) burden of rehabilitation.

While there are valid arguments against requiring a freshly imposed security to apply retrospectively to previous disturbance, once a security condition is imposed it must be sufficient to cover all extensions to the mine site from that date.

Progressive Reassessment

The level of the security must be subject to regular review if the amount is to reflect actual rehabilitation costs. Reassessment should be tied in with periodic reporting against the Management Plan.

Documentation

It is recommended that the form of the security be via an unconditional performance bond, fully guaranteed by a bank or other acceptable financial institution. Cash bonds and term deposits have led to problems in their recovery by Departments and are not generally recommended.

Security Deposit Retirement

Partial release of the security as work progresses is seen as an incentive for the company and an equitable reward for work carried out. The remaining security held should be sufficient to complete all anticipated rehabilitation, subject to any discount factor applied.

Utilisation of Security upon Default

Where a forfeited security is insufficient to complete the necessary rehabilitation, there is a need for the Department to be able to extract the difference from the title holder before expenditure is undertaken.

Using financial assurances to manage the environmental risks of mining projects

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PUBLIC POLICIES TO MANAGE ENVIRONMENTAL ISSUES IN MINING

Mining, in much of the world, provides foreign exchange, income and employment, tax revenues which can be used to build infrastructure and fund governmental programs, and a means to fund economic development. However, mining can also bring environmental degradation, threaten aquatic habitats, and adversely affect other sectors of the economy such as farming and fishing. Government decision makers use a variety of approaches and public policy tools to prevent, control and remediate the potential environmental consequences of mining. Common approaches include:

(a) Command and control techniques which rely primarily on quantitative chemical standards and criminal penalties for enforcement;

(b) Technology transfer, information, and education: and

(c) Economic instruments which allow firms to make a wider range of decisions about how to minimize environmental degradation.

Many governments are now considering developing another approach: "financial assurances," which redistribute the risks of environmental damage from the public sector to the private sector. Financial assurances typically require mining companies to guarantee financial responsibility for reclamation of mine sites. There are a number of specific financial instruments grouped within the broad category of financial assurance, including several types of bonding, trust funds, and insurance programs.

How countries choose to approach the regulation of mining environmental problems will impact the mining sector, the likelihood of achieving public policy objectives over the long run, and political acceptability. In countries which want both a dynamic mining sector and environmental protection, the thoughtful selection of approaches to managing mining environmental issues is important.

The first section of this paper briefly describes and reviews the main categories of environmental protection policies, concluding with an introduction to financial assurances, the focus for the rest of the paper. The second section briefly reviews methods of calculating the value of financial assurances. This is followed by a discussion about mechanisms available to implement financial assurance and finally, a set of policy recommendations.

COMMAND AND CONTROL POLICIES

Command and control approaches are typically "media" specific. designed to reduce discharges of specific pollutants into air. land. or water. Most often measured by quantitative chemical or physical standards. (other types of standards. such as biologically based narrative standards are also possible) command and control measures are designed to be enforceable by administrative or legal actions. This approach can be effective and successful in reducing many types of pollution. particularly in circumstances where a single polluter can be identified. the discharge of the pollutant can be tracked and monitored with a high degree of accuracy. pollution prevention is both technically and economically feasible. and there is little variation in the site-specific characteristics of the industry being regulated.

There are many industries whose activities fall within these boundaries. For example. command and control can be the most cost-effective and efficient approach to regulating many manufacturing processes. where climatic variation. rainfall. or altitude have little or no effect. the production process is relatively standardized. and the pollutant is released from the factory via discrete pathways. Even under these optimal circumstances. command and control approaches are costly to implement and maintain. require a well-educated and well-trained enforcement team. extensive support from laboratories and consultants. and an effective administrative/judicial system. There are both advantages and disadvantages to the use of command and control approaches for mining projects. Because every ore body is unique. the standardized measures of compliance which are inherent in traditional command and control may be less than fully effective. Effective environmental protection in mining should allow for characteristics which are specific to each mine site. such as site geochemistry. water balance. presence of fragile ecosystems. altitude. distance from receiving bodies of water. slope and stability of surrounding land forms. and socio-cultural values in the host community. Command and control approaches can result in significant under-protection at some sites and create an onerous burden of over-protection at other sites.

Regulatory compliance often becomes the primary goal of industries regulated under command and control systems. There may be little incentive to develop new pollution prevention technologies and innovative production processes. Scarce social and economic resources are often drawn away from such activities as research and development. and devoted to litigation and regulatory compliance.

TECHNOLOGY TRANSFER. INFORMATION. AND EDUCATION POLICIES

Technology transfers. dissemination of timely and appropriate information. and education are important to the successful management of mining environmental issues for several reasons. First. asymmetries between regulators. communities. and the mining industry are reduced. The result can be more effective participation of all parties affected by a mining project. participation which has become increasingly important to successful mine development. operation. and closure. Second. information and education can assist small operators and artisanal miners who often have little or no access to state-of-the-art information about current engineering and environmental practices. Technology transfer programmes. the development and dissemination of data bases. capacity-building seminars. training in "best environmental management practices." and establishment of industry boards for self-monitored performance standards. are all activities which fall within the purview of information and education.

Technology transfers. information. and education are extremely cost-effective long-term approaches. Significant investments in teachers. training centres. materials. and travel are required. However. much of the investment is in "human capital". and the benefits of education extend to the entire community.

Innovation in solving site-specific environmental/mining challenges is enhanced, environmental problem-solving skills throughout the community are strengthened, and opportunities to prevent pollution and increase profits in mining are illuminated.

Basic knowledge about the mechanisms and management of mining related pollution can be applied in a culturally appropriate, site specific manner. Experience has shown that effectiveness is limited when information and education programs focus on the dissemination of rigid, externally developed systems of laws and environmental management approaches. These transposed schemes are often informed by a culturally prescribed set of values and beliefs which may or may not coincide or be relevant to the host community undertaking the challenge of raising the level of environmental performance in mining projects.

ECONOMIC AND FINANCIAL POLICIES

Economic instruments available to address environmental pollution include taxes, credits, rebates, subsidies, penalties, marketable pollution permits, deposits, and effluent charges, as well as many other approaches such as bubbles, offsets and emission banks. Economic instruments vary widely, but all are intended to internalize "externalities," those spill-over effects which are not incorporated into the costs of either production or consumption of a good. *Unmitigated* mining environmental externalities generate costs for society in general (or a subset of society, such as residents in close proximity to the mine, or fishermen) via impacts to human health, political unrest, degraded water quality, lost habitat for flora and fauna, foregone opportunities for future land uses at the mine site, and many other ways. (Positive externalities associated with many mining projects include such benefits as increased income, schools, roads, hospitals, and public revenue.)

Economic instruments are used to transfer the costs of externalities back to the private producer or consumer. Where the character of environmental problems in a given industry varies widely, economic instruments, such as marketable pollution permits, can be particularly effective and efficient.

In general, economic instruments, combined with information and education, can be the most appropriate environmental management approach for mining: there are often many small entrepreneurial operators using limited pollution controls, and a few large corporations using state of the art pollution control technologies; there is wide variation in mining processes from one mineral to another; and there is wide variation in the climatic conditions which determine much of environmental "risk".

Economic instruments are preferable to command and control when applied to mining for a second, perhaps more important, reason. Mining occurs, by definition, in mineralized regions. These are regions where the background levels of environmental contaminants, such as arsenic, lead, and zinc, are often naturally high. There are often many mines in these regions, and discharges from mining operations are seldom discrete. Impacts to waterways from surface runoff and discharges to groundwater may not occur adjacent to the mine, but many miles away. Where there is more than one mine, the background levels of contaminants are naturally high, and pathways for transport are not discrete, it is very complicated and expensive to identify the polluter and enforce environmental standards. Economic instruments offer an alternative way to encourage voluntary action when command and control is not effective or feasible.

Economic and financial incentives can be developed to encourage many environmental goals, such as recycling, conservation, reclamation, or pollution prevention. The dissemination of mining methods which incorporate no-cost/low-cost approaches to environmental protection is an important result from the application of economic instruments. Top soil storage improvements, engineering-hydrologic modifications to control diffuse run-on and run-off from tailings, and recycling of process waters and reagents can be encouraged with economic instruments.

The primary advantage of economic instruments is that they encourage both producers and consumers to evaluate alternative ways to reach environmental goals: cost effectiveness, personal preferences, cultural values, and access to technology can be incorporated into this evaluation. This is information to which regulators often have no access, or which is extremely costly to acquire.

The effective design and implementation of economic instruments requires a well trained and educated regulatory community, but with a different mix of skills and abilities than is necessary for command and control approaches. Additionally, economic instruments may need to be backed up by the command and control aspects of regulation to be successful.

FINANCIAL ASSURANCES, A HYBRID POLICY

Financial assurance is one such "hybrid" economic instrument, which must be complemented by permitting, environmental assessment, inspection and enforcement, and education to be effectively implemented. Standard financial assurance tools and mechanisms are intended to insure that a normal range of costs associated with reclamation and closure of mines will be paid for by the mine owner or operator, either directly or through some alternative mechanism which assures their financial responsibility. These mechanisms are typically not intended to insure against catastrophic events. Financial assurance assumes that the costs of reclaiming and restoring mined land to subsequent uses, and protecting the public from safety threats such as open adits,shafts, and subsidence, are ultimately the responsibility of the owner or operator of the mine.

A comprehensive financial assurance program has three parts: permitting, inspection and enforcement, and the financial assurance itself.

Permitting as a component of financial assurance

The permitting process is important for three reasons. First, the permit can be used to clarify the standards for reclamation and environmental performance at the mine. Second, the mine plan is the foundation for calculating the amount of financial assurance, which is often inversely related to the amount of pollution prevention which is built into the mine plan. A mine designed for optimal reclamation will have planned at the beginning for top soil storage, regrading and slope stabilization, revegetation, water management, ongoing reclamation (if possible), and any other engineering and environmental practices deemed by the regulatory authorities to be good practice. The third reason is that the permit is often the only way to successfully enforce the environmental performance and reclamation standards. The mine permit, or an alternative administrative document tied to the right to continue mining, should clearly and explicitly define the terms for release of financial assurance: this protects both the operator and the regulator.

Inspection and enforcement components

Inspection and enforcement are the second essential components of a good financial assurance program. Ongoing inspections require regular communication between the regulator and the miner, with the goal of identifying problems in their formative stage. Many mining environmental problems, including acid generation, can be successfully mitigated and managed if identified early enough. Inspection and enforcement, early and often, will help minimize the problem which occurs when all reclamation, remediation, and closure activities are left until mining is completed, the ore is depleted, and the cash flow available to the firm to reclaim and close the mine is at its lowest.

The enforcement capacity of the regulator must be clearly and explicitly defined: all parties, including the provider of financial assurance provisions (banks, insurance companies, trust fund operators, or others), should be aware of the implications for the financial assurance in case of permit violations, bankruptcy, or other possibilities, including the capacity of the regulator to seize assets or close the mine.

Mechanisms

There are many mechanisms for providing financial assurance. These include bonding systems, trust funds, insurance plans, and many other institutional structures which provide assurance of financial responsibility, each developed to meet specific needs. The primary ones addressed in this paper are surety bonds, bond pools, trust funds, and the financial test. Environmental liability insurance plans are available from a very small number of providers, and provide extremely limited coverage. Guarantees from parent corporations are also used to provide financial assurance. These last two mechanisms are not addressed explicitly in this paper.

Surety bonding

Sureties are business entities which agree to be responsible for the debts of another party, or the failure of another party to perform an action, typically a reclamation and closure action in mining. Sureties guarantee either that the costs of reclamation and closure will be paid, or that the reclamation will be performed. Surety bonds transfer the risks of environmental non-performance (which results in negative externalities) from the public to the surety; the surety assures that the miner will perform required reclamation and environmental protection activities.

In its most basic form, the owner/operator of the mine purchases a surety bond, based on current cost estimates of closure, and this mechanism assures that there will be sufficient financial resources to close and reclaim the mine. There may be a requirement that the owner/operator of the mine provide collateral, which in many cases is up to 100 per cent of the cost of reclamation.

As with all approaches to financial assurance, the advantages to using this mechanism must be weighted against the disadvantages, in the context of the regulatory regime where it is being considered. One difficulty which arises with this mechanism is that a sureties industry must exist, and it must, in turn, be regulated itself. The failure rate of businesses attempting to enter the sureties industry in the United States has historically been quite high. When the surety goes bankrupt, both the regulator and the mining firm lose.

Oversight of the sureties industry requires an investment in building regulatory capacity. There is, however, an major advantage to the use of sureties as a financial assurance mechanism. Because they have a financial interest in the control of environmental degradation at mine sites, the sureties industry can become a partner of the regulatory community, carrying out inspections and setting standards for environmental performance.

Bond pools

Bond pools are designed to pay for reclamation and closure costs incurred by bond pool members in case of bankruptcy or other unforeseen events which render them financially unable to fulfil reclamation and closure commitments. Bond pools are often proposed to meet the needs of small operators, many of whom are unable or unwilling to provide the substantial collateral (often 50 to 100 per cent of the bond) required by sureties firms. Membership in bond pools is voluntary. There is typically a "test" for entry, which includes evaluation of the following: compliance record, including number of permit violations; financial standing; years in operation; and reclamation experience.

Following admission, members may be categorized according to the "risk" which they bring into the pool, and payment into the pool takes that risk factor into account. While payments are often based on tonnage mined, or surface disturbance, there are other approaches to incorporating the wide variation in environmental costs which can occur. For example, site-specific conditions may dictate that operators in fragile ecosystems, or in regions likely to generate acid, be charged higher membership fees.

Bond pools can be difficult to administer, and have not been successful in the United States. One of the many problems which plague bond pool schemes is that of the "free rider", that is, the mining company or operator who joins the bond pool, pays in a minimal amount, and then declares bankruptcy or discloses a serious environmental problem. Responsible firms carry the burden of free riders, and this can deplete the assets of the pool which are available for legitimate purposes.

Non-surety collateral bonds, or trust funds

Collateral bonds, essentially equivalent to trust funds, are yet another variation in the world of financial assurance mechanisms. These are indemnity agreements made by the mine owner/operator, and they involve the mine owner/operator setting aside collateral, cash, or cash equivalent financial devices, equal in value to the estimated costs of reclamation and closure. These funds or assets are then held in trust by the regulator, the government, a bank, or similar financial institution. It is necessary to make clear from the start whether the interest earned on these funds while in trust is to be returned to the owner/operator or held by the government for the following purposes: compensation for administrative costs, offset of reclamation costs at sites where financial assurance was not sufficient, or as a source of funding to remediate abandoned mines.

A standard list of cash or cash certain devices acceptable as collateral would include the following:

- Cash
- Stocks and negotiable bonds
- Certified checks
- Irrevocable letters of credit
- Certificates of deposit.

However, there are instances where regulatory authorities agree to accept the title to land and/or equipment at the mine in lieu of cash or cash-equivalent collateral. These types of collateral may be difficult to liquidate, be in poor repair if the firm is in financial hardship, and have little market value by the time the regulator gains possession. Additionally, gaining access to these assets may be particularly problematic once it is clear that the firm has, or intends to, take bankruptcy. The regulator may have to queue up with other creditors. These effect of these barriers will vary, depending on the legal authority of the host government.

Self bonding or financial tests

This approach is based upon evaluating the financial health of the mining firm, and acquiring assurance from the firm itself that sufficient funds will be set aside to carry out reclamation and closure obligations. Many large firms prefer this method of proving financial responsibility. There are significant advantages for the mine owner or operator in this approach, including tighter control of funds and savings in reduced transactions costs.

One disadvantage to this approach are that there are times when even large companies which look good on paper must declare bankruptcy, leaving the public (government) to absorb the full costs of any reclamation, remedial actions, and closure. There is no redistribution of this risk to a third party. Additionally, firms may account for their contributions to the reclamation funds with accrual based accounting, and not cash contributions to a "sinking fund". While this is not intrinsically risky with most reputable firms, it is an approach which, in theory, could result in cash not being available at the end of the mine life. The primary disadvantage to this approach is, however, that evaluating the financial health of a mining company is extremely sophisticated business, with the number of ratios and financial indicators used to make this decision expanding rapidly. This type of expertise seldom can be found within government, leaving regulators with the need to contract out the financial analysis, or be at a distinct disadvantage in negotiating the proper limits and constraints to self bonding. (Guarantees from the parent corporation are subject to the same comments.) Among the financial indicators most often used but not recommended as adequate are the following:

- Net worth of the firm
- Ratios
- Assets
- Bond ratings

Calculating financial assurance

The amount of financial assurance which is required should be based on cost estimates derived from the mine plan. From the plan, discrete reclamation and closure activities can be identified. The overall objectives of reclamation and closure usually include the following: removal or closure of imminent safety threats; protection of water quality to the desired level in bodies of water impacted by mining activities; minimization of surface erosion potential in affected areas; and, in general, restoring mined land in such a way as to assure that mining is a temporary use of the land and that, subsequently, other economic uses are possible. Specific tasks can be identified, such as re-contouring, replacing topsoil, revegetation, and highwall reduction. The following concise approach is provided by the California Mining Association in its Surface Mining and Reclamation Act, Financial Assurance Guidelines (CMA, 1993).

> "... Following the identification of broad reclamation categories, the component parts of these tasks should be identified. For example, revegetation may include seed bed preparation, seeding and fertilizing, irrigation and weed control. Each of these subtasks should be estimated individually to simplify the process. Where grading of pit area is part of the reclamation plan, we recommend that cross-sections and maps of pit areas be used to justify grading quantities.
>
> Identify the equipment necessary to complete the identified task
>
> Identify labour requirements

Identify materials to be used

Define unit costs

Multiply the Unit Cost.(e.g. $/hr.) by Production Rate (e.g. cy/hr) to determine the total cost for each cost item (e.g. Scrapers). Add the costs for all cost items to find the total cost per category. (e.g. Equipment).

Add total Cost of all categories (i.e. Equipment. Labour. Materials) to determine total cost of reclamation.

Add charges for Supervision. Profit and Overhead. Contingencies and Mobilization." (CMA.1993)

Although this provides a general outline of the process used to generate a cost estimate. each mine has distinct and unique operations associated with each phase of development which need to be assessed. It is important to identify the sources of information in cost estimates. Invoices. contractor estimates. and standard cost manuals are valid sources. Additionally. any assumptions made while generating cost estimates should be clearly and explicitly stated. It may prove useful to develop cost estimates under a range of explicit and distinct scenarios. which reflect high. medium (expected) and low costs. An example of a high cost scenario may be when tailings piles which were not predicted to generate acid begin to do so. and additional remediation for proper closure is needed.

Determining the basis for cost calculations

The policy objectives of the host government should be considered when deciding whether to require financial assurance for the entire mine life. or for smaller increments of time. This decision impacts the economic viability of the mine. particularly for small operators. All costs should be summed using a net present value approach. regardless of the time period for evaluation.

Full life

This method requires that financial assurance be provided which guarantees sufficient funds for all reclamation and closure activities for the entire estimated life of the mine. along with any post-closure activities which are necessary. The approach sums the ongoing reclamation costs over the mine life. The total costs can be high. even when discounted to present value. This can render a marginal project unfeasible.

The primary advantage to this approach is that it provides maximum security to the risk averse regulator and host government. It is feasible in a strong market where the host government has many operators competing for the right to mine. Additionally. some regulators may feel that there is less need to revisit and review the financial assurance once it is in place for the life of the mine. thereby freeing up scarce regulatory time and talent for other tasks.

However. reclamation and closure costs may change dramatically over the life of the mine. and if they are not periodically reviewed. the financial assurance may prove to be either inadequate or unnecessarily high. Depending on the financial assurance vehicle. this approach can also "tie up" the mining companies' funds until after successful reclamation and closure has occurred. Surety bonding firms may be hesitant to write bonds for these extremely large amounts, partially because of the uncertainties of predicting thirty years (or longer) into the future. If a trust fund mechanism is used, monies may be misappropriated. Whatever the mechanism, it is necessary to ensure that these funds will indeed be available to be returned to the operator, or used for reclamation and closure at the end of the mine life.

Two to five year increments

Financial assurance can also be calculated by dividing the life of the mine into shorter time periods, based on the mine's plan for on-going reclamation. Current practice at many sites dictates that reclamation and closure activities (and their associated costs) occur not only at the end of the mine life, when the resource is depleted, but begin even at the design stage.

The advantage to this approach is that it creates less financial burden for the mining company. Additionally, because of the need for frequent re-evaluation, regulators and the enforcement team can anticipate potential problems before they happen. (A list of changes which may trigger a re-evaluation is included below.) All firms may not be willing to submit to this level of scrutiny after the mine is permitted, and all regulators may be not be able or willing to participate in such a labour intensive form of regulation, which requires highly qualified and trained regulators. For this system of incremental financial assurance to work, the regulatory agency must have both the will and capacity to enforce agreements and negotiate changes.

Finally, although this approach minimizes the delay of costs until the end of mine life, there may be reclamation and closure activities which cannot be completed until productions ceases. It may be necessary to add a small "closure premium," (in addition to the reclamation costs calculated each time increment,) which is put into a sinking fund to assure that closure can be completed when the mine is not generating revenues.

Surface disturbance

In this approach, financial assurance values are calculated based on the total surface area which is disturbed over given periods of time. This approach is subject to essentially the same set of advantages and disadvantages as the above.

Periodic review

The effective implementation of all financial assurance programs requires periodic review. This review should be agreed to by the owner/operator when the program is set in place. There are a number of circumstances which may indicate a need to recalculate the amount of financial assurance required, or the financial mechanism. Such circumstances include:

- Successful exploration which expands the life of the mine;
- Significant change in product price which affects profitability;
- Change in the regulatory requirements or new permitting requirements;

- Installation of new technologies or management approaches which minimize pollution:

- Innovations in modelling and prediction which indicate potential environmental problems different from the initial plan:

- Significant long-term movements in the factors included in cost estimates, including inflation rates:

- Discovery of valuable historic/cultural/ecologic resources at the mine site:

- A change in cooperation and compliance of the mining firm:

- A change in the financial status of the firm (bankruptcy, changes in credit rating, law suits, etc.).

POLICY RECOMMENDATIONS

•The solution to one problem can sometimes create another, unintended, problem. The unintended problem in the case of financial assurance is that small operators can be driven out of business. The additional cost of purchasing bonds or paying into a trust fund is particularly threatening to the economic viability of small mines. Artisanal and small mining is a critical and irreplaceable source of income for many workers in much of the developing world. Large mines, which may be able to absorb the additional costs, can gain an even greater share of the market when small operators are driven out by high compliance and bonding costs. This can result in the large mining firms holding a great deal of economic and bargaining power in the host country. Research is required into alternative financial assurance mechanisms which ensure some degree of reclamation, particularly the closing of shafts and adits, without creating onerous financial burdens for small operators.

•Regulators often have a difficult decision to make when attempting to enforce reclamation, closure, and environmental provisions. Overzealous enforcement can force an operator into bankruptcy, leaving him/her free to go onto another activity, and leaving the regulator with a "problem" mine. Most regulators prefer not to operate mines. Providers of surety bonds may have an incentive to do the reclamation and closure work themselves, once the mine owner or operator has withdrawn, rather than to pay the regulator. This can be advantageous to all parties. Deciding when to work with a miner who clearly is not meeting permit requirements and when to call for financial assurance to be exercised requires wisdom and perseverance.

•The sureties/financial assurance industry can be a partner in enforcement of permitting provisions. It is motivated by financial self-interest to make certain that mines are operated in compliance with requirements, and it can be viewed as an extension of the regulator, carrying out its own inspections and compliance reviews.

•For financial assurance mechanisms to be successful, there must be an industry, or perhaps a branch of government, willing to provide these services. This has been a problem in the United States, as many of the firms which provided financial assurances went bankrupt themselves, leaving governments and taxpayers with financial responsibility. Regulators may want to have a plan in place for when those providing financial assurance cannot, or will not, pay.

•Some of the most serious problems with respect to financial assurance can occur when there are no clear and specific terms for release of financial assurance. Additionally, the terms of termination or transfer of mechanisms must be explicit to all parties if these tools are to be used successfully. For example, an operator may want to use a trust fund in early years of operation and shift to a sureties bond in later years. There should be a clear process for appeal.

•When large sums of money are held for long periods of time, it may be difficult to ensure that the money is available to be returned to the mine operator, or alternatively used for reclamation and closure, at the end of the mine life. Who is the trustee for the funds? Government, banks, or other? How do you ensure that funds held in trust are not appropriated for other uses? What is the test of qualification of financial institutions to issue letters of credit, or of insurance firms to issue policies? Finally, the ownership of interest accrued while funds are held should be determined when the financial assurances are put in place.

•Perhaps the most important policy question in the field of financial assurance is that of how to design mechanisms and cover costs for catastrophic events, that is, events which cannot be predicted or perhaps even managed. These events have such a low probability of occurrence that any attempt to statistically evaluate them and assign an economic value is meaningless. However, if these events do occur, the costs of remedial work can quickly deplete even well funded regulatory budgets. Ultimately, the answer to this question will be a value judgement, reflecting the amount of risk which decision makers in our societies feel they can and should absorb, in exchange for the benefits which mining can potentially bring, particularly in resource-rich parts of the developing world.

In summary, it may ultimately be a combination of command and control, information and education, economic instruments, and financial assurances which is most effective in achieving environmental protection. The questions which regulators and other decision makers may want to ask when designing programmes include:

•What are the environmental objectives?

•What are the economic objectives?

•Is the approach cost effective?

•Is it feasible, politically and otherwise?

•Does the infrastructure to support the program exist, or willthat have to be created also?

•What is the equitable distribution of risk, and risk management, which will protect the environment and still allow for economic activity?

Suggested Reading

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Successful reclamation

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The primary goal of reclamation is to establish a permanently stable landscape that is aesthetically and environmentally compatible with surrounding undisturbed lands. The post-mine land use can contribute to the productive capacity and stability of the ecosystem of which it is a part. Further, the reclaimed lands can be suited for alternative uses if these become more economically and socially feasible in the future.

Each reclamation area is not a separate entity. Reclamation programs can strengthen the productivity and/or stability of the entire system in which the land to be mined is located. The public interest will be best served by keeping reclamation laws and regulations sufficiently flexible so that reclamation planning can consider the best contribution of the reclaimed land to the ecosystem in which it occurs. This approach to reclamation serves the long-range public interests.

Reclamation activities often focus on post-mine land use, topographic configuration, depths and spatial distribution of soil replacement, and species selection and evaluation for revegetation. There is a great deal of success around the world in reclamation for a variety of climates, altitudes, mined/disturbed soils, overburden (waste rock), and tailings. This paper suggests some flexible methods for ensuring successful reclamation.

DEFINITIONS

What is reclamation and how is it different from restoration, rehabilitation and revegetation? Here are some suggested definitions (used by the coal mining industry in the United States):

Reclamation: Implies that land disturbed by mining activities will be returned to the *approximate* pre-mine use. The area would be reshaped to about the pre-mined contour (where economically and technically feasible) and plant and animal communities would be reestablished to approximately pre-mine levels. In general people support this concept, while environmentalists also insist that native species be reestablished whenever possible.

Restoration: Denotes returning to the conditions that existed prior to mining activities. It is more stringent than reclamation as it would include reshaping to pre-mine contours, restoration of pre-mine surface and ground water patterns, and reestablishment of plant and animal communities. Hard line environmentalists generally support this concept (note: duplication of pre-mine conditions is probably never completely possible).

Rehabilitation: Suggests returning the site to a stable and permanent use in accordance with a pre-mine plan. This could include the pre-mine use, a more intensive agricultural use, or conversion to a recreational or wildlife area. The new land use is assumed to be more beneficial to society than the pre-mine use. Most agriculturalists support this approach.

Revegetation: Implies covering an area with vegetation. There are no efforts to recondition the soil or need for contouring the land but the need to establish a "green" stable cover of vegetation and then to allow natural selection processes to take over.

When developing flexible reclamation policies it is important to keep these definitions in mind so that people are aware of what the goal of a "reclamation" project is.

RECLAMATION SUCCESS

Laws and regulations are necessary to help to ensure that people are protected and long-term problems or disasters do not occur. These "controls" on the mining industry however need to be flexible and reasonable.

The following steps are suggested to be undertaken by mining companies and the government to ensure reclamation success:

Step 1: Develop a written plan including a land use map showing all areas to be mined and disturbed by the operations. A year by year estimate of the disturbed areas should be attempted but this needs to be recognized as an estimate and updated annually.

Step 2: The areas in step 1 need to be evaluated for stability and earth moving to ensure long-term stability. Part of this evaluation is the consideration of hydrology and run-off (physical handling and flow of water through the area).

Step 3: The areas in step 1 could then be classified as reclamation, restoration, rehabilitation, or revegetation areas. This is not difficult to do. By evaluating the physical and chemical characteristics of the overburden, tailings and soils including nutrient levels (nitrogen, phosphorus, and potassium (NPK)), pH (acidity), net acid generation potential, soluble salts, cation exchange capacity, organic levels, and presence of sulphur, most mining areas can quickly be evaluated for ease of reclamation. Obviously, for mines containing radioactive soils or other more complex situations a more thorough review is needed.

Step 4: The AMDAL environmental impact process in Indonesia can now evaluate the reclamation plan from different government perspectives so as to ensure that people outside the mining industry are satisfied with the lands to be disturbed and the time tables and final land use patterns in relation to the undisturbed areas around the mine. The detailed management and monitoring plans can clearly state what is going to happen over time and what the company is going to do to ensure reclamation success. This plan can be updated on a periodic basis as more information becomes available.

Step 5: Mining companies can quickly develop demonstration reclamation projects which show that a variety of vegetation can be supported on the mined or disturbed lands. These demonstration reclamation projects also help provide experimentation which is invaluable for the larger reclamation projects which typically begin much later in the mine life.

Step 6: Mining operations need to have the necessary long-term financial resources to fully complete monitoring and reclamation plans. This is difficult, given the fact that mines must remain competitive on the world market and mineral prices fluctuate significantly and rapidly due to economic, social and political forces beyond the control of a company or government.

Small mines: Ensuring financial stability is especially difficult to do with smaller mines and often a trust fund is necessary as an insurance policy. A tax on the smaller operations is often most appropriate unless they are willing to spend money up front for a reclamation bond. Given the number of these small operations, a fairly uniform approach is necessary as the government cannot track all small operators with the resources available. The government can assist by providing sound technical information and inspections funded by the tax monies collected.

Large mines: With larger mines, a flexible approach is necessary for ensuring financial stability. First, the Department of Mines could review the plan and determine the risk involved with each project area identified in step 1. Only areas of moderate to high risk should be considered for long-term financial stability. Second, there are basic financial tests which can be done on a company to determine if it is financially sound. Third, financial security for land reclamation in the State of Florida in the United States is dependent upon the operator meeting the "rate of reclamation schedule" (typically a five year block schedule) which is already part of a management plan. If an operator meets this schedule, it is not required to post any security. If it does not meet the reclamation schedule, it must meet one of six methods of financial security including: a lien against the property, a surety bond, a letter of credit, a donation of land acceptable to the State of Florida, a cash deposit, or a trust fund payable to the state. The choice of method is left to each company.

Step 7: The Department of Mines and the company need to cooperate to ensure that reclamation is successful and on schedule and the company maintains its financial stability. An annual reclamation report and annual inspections help to facilitate clear communications. The demonstration reclamation projects will give the government and company a good idea of the ease of reclamation and what extra costs are going to be involved with successful long-term projects. If the demonstration projects are not successful the reclamation plan should be reviewed. Workshops and other opportunities are also helpful to build trust and improve communications and to develop good working relationships. This is especially important in Indonesia where promises made by companies need to be kept in order to maintain good relationships.

CONCLUSIONS

Government and company reclamation policies can place affected lands in the proper perspective in relation to the ecosystem in which they are located. Maintaining enough flexibility to allow the development of site-specific reclamation plans, evaluating all disturbed lands and classifying those lands into appropriate "reclamation" categories thus setting long-term goals, is important. Ensuring long term success by tracking the financial stability of companies (using a flexible approach by incorporating several methods) and following the agreed upon reclamation plan is also worthwhile.

Summary of discussions

It was noted that society's attitude to mining and its associated environmental problems has changed over time. Successively, the focus has shifted from exploitation to regulation and on to cooperation and consultation. This is particularly clear in the case of rehabilitation. While a cooperational approach has to some extent to rely on a commitment to sound environmental practices on the part of operators, rehabilitation cannot be left to the good will of the companies alone. Governments have to assume the responsibility of providing an adequate framework.

The rationale for imposing rehabilitation obligations on operators is - as in the case of all environmental regulation - that the social costs of environmental damage are higher than the private costs experienced by the operator. In the absence of regulation, the difference between social and private costs is borne by society. In the particular case of rehabilitation, the cost is borne by future tax payers and the future inhabitants of local communities. The objective of regulation should therefore be to eliminate the difference between social and private costs, mainly by assuring that adequate funds are set aside for rehabilitation once mining is finished. Most countries in the region have included rehabilitation requirements in their mining or environmental legislation, and many of them have introduced or are in the process of introducing financial guarantee schemes for rehabilitation.

Several types of financial guarantees are used to assure that rehabilitation funds are sufficient. The various types and their respective advantages and disadvantages were discussed extensively. The objectives common to all types of financial guarantees are:

(a) To ensure that there is a post-mining land use;

(b) To ensure that mining does not destroy or limit other land use options;

(c) To prevent off-site contamination; and

(d) To prevent intergenerational transfer of problems or deferral of costs.

It was noted that requirements to set aside large amounts of capital at the start of a project may deter investors, while trust funds corresponding to the cost of rehabilitation at any stage of development and exploitation does not have this disadvantage. Furthermore, it was noted that certain kinds of financial guarantees require a well-developed financial industry to be feasible, and therefore may not be realistic in some countries. From the point of view of the regulatory agency, it was important to study carefully the financial situation of the companies concerned, to review rehabilitation plans at regular intervals and to monitor actual rehabilitation during the life of the mine. Finally, small-scale and artisanal mining raise particular problems with regard to the use of financial guarantees, and policies need to be developed to deal with these problems.

SESSION IV: MONITORING AND ENFORCEMENT

Environmental management in the mineral industry in Viet Nam

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INTRODUCTION

Vietnam is endowed with abundant and diverse mineral resources. In the last 40 years, as a result of a basic geological investigation of the entire territory funded by the Government, various mineral deposits have been discovered. The mineral reserve evaluated before 1945 has been reassessed and increased. Five thousand new deposits and ore occurrences have been found, and detailed exploration has been conducted on important deposits of iron ore, copper, tin, coal, bauxite, titanium, kaolin, pyrite, bentonite, pyrophyllite, diatomite, raw materials for cement production and construction materials. Some of these resources are already being exploited to meet domestic demand and for export (kaolin, ilmenite, silica sand, antimony, facing stone). Although Vietnam's mineral industry is still young, it has played an important role in national socioeconomic development. About 1,000 deposits of 30 kinds of minerals are being exploited throughout the country at the present time. Most of the operations are small in scale with outdated mining technology. The total production of the mining industry is very small (see table 1). This small figure contrasts with the vast mineral potential, the reserve already assessed and the great domestic demand for raw materials. On the other hand, the negative impact of mining activities on the environment is a fundamental problem which requires an appropriate solution.

Table 1 Vietnamese mineral production

COMMODITY	PRODUCTION	YEAR
Coal	6.2 million tons	1977
Petroleum	3.4 million tons	1993
Apatite	259,000 tons	1993
Pyrite	99,800 tons	1993
Gold	<1 ton	N/A
Tin	2,570 tons	1993
Building Materials	>30 million m^3	1993

MINERAL ACTIVITIES AND THEIR IMPACT ON THE ENVIRONMENT

Activities associated with the exploitation of minerals have a comprehensive and direct impact on the natural environment and on cultural and social life. There are many factors causing adverse impacts on the environment.

State management skills, the legality of the mineral activities, scale of mining activities, location and technology directly or indirectly cause impacts on the environment. The main causes of adverse impacts on the environment in Vietnam are:

- State environment management is neglected. Not until late 1993 was the Law on Environment Protection passed by the National Assembly. Although attention has been paid to environmental protection in mineral activities through the Ordinance on Mineral Resources adopted in 1989, it addressed only general principles. In practise, supervision, monitoring and punishment for violating environmental rules have been lax, with few mineral title holders being fined for infringing the rules.

- Illegal mining occurs in all provinces and cities of Vietnam. The Government can not control this situation. Illegal mining activities focus on minerals such as gold, tin, tungsten and gemstones. Mercury and cyanide are used indiscriminately for gold extraction, causing serious pollution of water sources, damage to the flora and fauna, and deterioration of human health.

- The discovered mineral deposits are mostly of a small size and spatially dispersed so that their impact on the environment covers a large area.

- In small-scale mining, technologies for the treatment of tailings, waste water and residues are not used; moreover rehabilitation measures are not undertaken.

- The people directly involved in mineral activities have only a limited awareness of environmental issues.

PRESENT SITUATION OF THE ENVIRONMENT IN MINERAL ACTIVITIES IN VIETNAM

Until now the State has not controlled factors impacting on the environment which are the result of economic and social development in general and mining activities in particular. All the regulations enacted by the State on environment protection are now being improved; in practise these regulations were rarely enforced. Mining activities, both illegal and legal, cause adverse effects on the environment. Cultivated soils and forests are damaged and water and air are polluted. Moreover, chemicals (mercury, cyanide) used for gold extraction have been used in a haphazard way and have not been controlled. The mine owners do not apply appropriate rehabilitation measures on the licensed areas after termination of mining activities. Where rehabilitation is attempted, proper technical procedures are not followed resulting in areas that can not support cultivation. Because of untreated waste dumps from mines, many rice fields have been buried, and river and stream beds have been silted up. Many major floods have occurred as a result of deforestation, causing heavy damages to human property. Indiscriminate water exploitation has resulted in salinization and pollution of water resources. The health of the miners and of people in the surrounding communities is deteriorating, and the number of fatal accidents attributable to land slides and collapses (mostly due to illegal mining) are increasing. A land slide caused the loss of hundreds of lives at the manganese deposit of Toetat, in Cao Bang province. Tuberculosis patients in the Quangning coal basin account for about 50 per cent of the total number of sufferers throughout the country. The dust concentration in the air in coal mines and in construction material quarries is hundreds of times higher than the standard limit. Until now there have been no statistical data on the environmental damages caused by mineral activities.

GOVERNMENTAL POLICIES ON ENVIRONMENTAL MANAGEMENT

Economic change has taken place for five years. The open-door and incentive policies designed to encourage overseas and Vietnamese individuals and organizations to invest their capital and technology in various economic sectors of Vietnam including the mining branch are very important. The mineral resource potential of Vietnam is great. The Law on Foreign Investment is favourable, and the recent Domestic Investment Encouragement Law and the Mineral Law to be adopted in 1995 create a legal climate that is likely to intensify both domestic and foreign investment in the mineral industry.

As Vietnam is entering a rapid industrialization stage, an important problem confronting the Government is how to control the negative effects on the environment.

In relation to environmental protection work, together with mobilization and persuasion, "Command And Control" is the main management measure available to the Government. To implement such measures, the State has to promulgate the Law on Environmental Protection and its related regulations. Specific management authorities must be established, and policies on environmental management for specific production sectors have to be clearly stated in the relevant laws, including the Mineral Law, Land Law and Law on Water.

The legal instruments which include elements of environmental management are:

- Law on Environment Protection promulgated 10 January 1994.

- Instruction by the Prime Minister on the immediate tasks to protect environment No-73(TTg) promulgated 25 February 1993.

- Official dispatch by the Ministry of Science, Technology and Environment on "Strengthening the environmental activities in the local areas", No. 317/TNMT, 27 February 1993.

- Provisional instruction on impact assessment enacted by the Ministry of Science, Technology and Environment and (MSTE) No. 1489 MTg, 10 September 1993.

- Inter-Ministerial Circular (MSTE) and State Planning Committee (SPC) temporarily stipulating the planning of environmental works No. 155/TTLB, 11 April, 1994.

Environmental management has also been addressed in various other laws:

- Law on Forestry
- Labour Law
- Ordinance on Mineral Resources
- Land Law
- Ordinance on Aqua culture

The Mineral Law and Law on Water are still under formulation.

Until now Vietnam has had no national environmental standards. The State's environment observation network is insufficient and there is only a limited environmental information system. Moreover, there is a lack of expertise and practical experience in the field of assessing environmental impact and the degree of environmental awareness of the people is poor. In spite of these disadvantages, Vietnam is in favour of gaining experience from advanced countries in the region and from the international community. Vietnam can draw on international experience in the application of market-based instruments in environmental management before applying these instruments to her own multi-sectoral economy

MINERAL DRAFT LAW AND ENVIRONMENTAL MANAGEMENT

The project coded VIE/92/009-Mineral Law, which is co-sponsored by the United Nations Development Programme (UNDP) and the Australian Government, is currently in progress. Thanks to technical support from foreign consultants and advisors, and to comments from various domestic and foreign agencies together with the Law Committee of Vietnam, the eighth Draft of Mineral Law is now being completed. It will be delivered to various related agencies and foreign agencies for final comments before submission to the Cabinet in October 1994 and tabled at the National Assembly in 1995.

The binding environmental protection obligations on the mineral title holder are clearly specified for each stage of development: prospecting, exploration, and mineral processing/beneficiation or purification. Once an application for any mineral title is filed, it must contain an Environmental Impact Assessment in which the adverse effect of mineral activities on environment are identified, appropriate mitigating measures are described and funds covering the expense of environmental protection and reclamation during mining and after closure specified. The mineral title holder must advance funds in the form of performance bonds or in another appropriate form to ensure that environmental obligations are fulfilled in any circumstances. The Mineral Law draft also clearly stipulates the terms of cancellation of a mineral title if during the course of its implementation the title holder does not observe the environment protection program approved by the Government.

CONCLUSIONS AND RECOMMENDATIONS

The Government of Vietnam has paid much attention to environmental protection. It is understood that not all the problems of the adverse consequences of mineral activities can be resolved overnight. The most important issue is how to minimize immediately the adverse impact on the environment resulting from mineral activities. In order to meet this goal the following measures are necessary:

-To strictly implement the Law on Environment Protection.

-To have the Mineral Law passed as quickly as possible.

-To intensify monitoring and enforcement of environmental regulations.

-To train qualified staff to assess the impact on the environment resulting from mineral activities.

-To study and apply market based instruments in environmental protection.

-To take advantage of the technical and financial assistance from international organizations and the global community.

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Mine safety and environmental management in Japan

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PREVENTION OF MINING RELATED POLLUTION

Despite its limited land area. Japan has abundant resources of copper. lead. zinc. and other non-ferrous metals. Attempts have been made to provide a stable supply of these resources through natural resource exploration and development efforts by the government and by the private sector.

In most industries. pollution ceases once emissions of fumes and waste water are eliminated by the closing down of the factory. However. in the case of mines. water from the mine and waste water from deposits of debris and tailings dams continue to flow after the operation is terminated. endangering the downstream environment unless the water emissions are treated properly. The problem of damage resulting from disused mining sites was called to our attention after the arsenic incident involving the closed Toroku mine in the Miyazaki prefecture in 1972. The pollution of downstream rivers by waste water from closed mines and damage from the accumulation of heavy metals in farmlands became evident at the same time. The prevention of damage caused by closed mines became a subject of national importance requiring immediate attention and the authorities needed to resolve the problem promptly.

Administrative policy for the mine safety systems then in place focused on the prevention of mine damage in operating mines. Special preventive measures with a view to adequately neutralize the waters from the mines and from deposits and tailings dams had to be devised to resolve the problem permanently. For this purpose. the Law on Special Measures for Mine Damages Caused by Metal Mining Industry. etc. which focused on the prevention of damage by closed mines. was adopted in 1972.

Furthermore. based on information gathered through the investigation of closed mines in a four-year project begun in 1970. a subsidy has been granted to local governments since 1971 to conduct mine damage prevention activities for mines where the responsible parties cannot be identified.

POLICIES FOR THE PREVENTION OF DAMAGE CAUSED BY MINES

The concept of prevention of mining-related pollution

The bases for preventive measures against mine damages are first. to prevent mine and waste water from being emitted from mines (counter-emission measures): second. to treat any mine water and waste water the emission of which cannot be prevented. in order to make it safe before it flows into public waters (mine/waste water treatment measures); and third. to treat the already polluted farmlands in downstream areas through the addition of fertile soil and other means (measures against soil pollution).

Pollution source control measures

Slag and debris deposits. one of the possible sources of mine damage. are usually covered with non-polluted soil and trees are planted to prevent the osmosis of rainwater and the erosion of surface sediments.

In order to prevent the occurrence of pollution due to mine water. the mine pits are either completely sealed with pressure resistant covers to shut off the outflow of mine water. or the surface of the mine site is landfilled and drainage channels are constructed in order to prevent the flow of rain and river water into the excavated mine.

Mine waste water treatment measures

Although it would be ideal to stop the outflow of mine waste water entirely through the use of counter-emission measures. in many cases it is difficult to control the outflow completely in already excavated mines. Measures for preventing the emitted mine waste water from entering public waters are necessary when the outflow cannot be stopped entirely. The treatment of mine waste water is an effective method of mine damage prevention where counter emission measures are unable to control the outflow completely.

The lime neutralization method. magnesium hydroxide neutralization method. and ion exchange resin method are often utilized in the treatment of mine and waste water. The choice of method depends on the characteristics of the water emitted from the mine.

Measures against soil pollution

Although soil pollution is a "secondary pollution" brought about by polluting agents carried by air and water. it is also a "cumulative pollution" in which the heavy metals and toxic substances introduced into the soil linger semi-permanently and it is not easy to reduce their concentrations.

Accordingly. in addition to providing appropriate counter emission measures to prevent the pollution of water and the atmosphere leading to further pollution of the soil. the accumulated toxic heavy metals and other substances are removed from the polluted farmland or diluted.

In the case of soil polluted with cadmium. unpolluted soil is imported into the polluted farmland. Imported soil is applied to a depth of 20 to 25 centimetres. and layers may be inverted in portions through groove digging. Copper and arsenic pollution is remedied by agitating the surface layer after importing unpolluted soil into polluted paddies, thereby reducing the concentration of the metals.

MINE SAFETY LAW

Unified management of the mining industry through the Mine Safety Law

The Mine Safety Law was adopted in May 1949 for the prevention of danger to mine employees and the prevention of damage caused by mines, and to enable the rational development of mineral resources. The primary purpose of the Law was the prevention of danger to mine workers. Concerning metal mines, the focus has shifted to the prevention of damage caused by mines, reflecting the recent increasing social demand for environmental preservation. Efforts for the prevention of damage caused by mines are now seen as being extremely significant.

Damage caused by mines is but one of numerous sources of pollution. In comparison with pollution caused by other industries, it can be characterized as follows:

- The damage is inseparably connected with the safety of mine workers;
- The prevention of damage caused by mines is closely related to the planning of mine development;
- Many sources of damage caused by mines are unique in nature;
- Damage may occur after the mining operation is terminated.

For these reasons, the Mining Safety Act is the most important regulation applicable to the prevention of damage caused by mines, and this type of damage is generally exempt from or only partially subject to general anti-pollution laws.

Obligations concerning the prevention of mine damage in operational mines

The Mine Safety Law is basically intended to define self-security (mine damage prevention) systems applicable to owners of mining rights (boring right owners, drilling right owners and crude ore mining right owners) for operating mines, including sites that are temporarily closed. Article 4 of the Law specifies "the prevention of danger and mine damage resulting from the treatment of gas, coarse particles, tailings, slag, mine water, waste water and fumes" as one of the obligations of the mining right owners. Although this article defines the prevention of mine damage as a general obligation of the mining right owner, the details are specified in the Ministerial Ordinance on Safety Regulations for Metal Mines, etc. (Article 30). As the general obligations defined in the article are applied to the ownership of the mining rights, the current mining rights owner is held responsible not only for the damage caused by his/her operation of the mine but also for the damage resulting from the actions of previous owners, and is responsible for the introduction of necessary remedies.

The specific details of the obligations concerning the prevention of damages caused by mines are found in the safety regulations. Chapter 11 of Safety Regulations for Metal Mines, etc., specifies the emission standards, reporting duties, and other obligations that should be observed by the owner of mining rights, depending on the nature of the damage caused by fumes, coarse particles, mine waste water, mining waste, tailings, slag or other deposits, land excavations, noise, vibrations, or toxic substances. "Regulations concerning the standards for the prevention of mine caused damage" specify the standards for fume emissions, mine waste water emissions, and measures to reduce noise and vibrations from mines. The details of regulations and applicable standards basically comply with respectively the Air Pollution Control Law, the Water Pollution Control Law, and noise/vibration regulation laws for industries in general.

Because in many cases a relatively long interval exists between the mining operation and the occurrence of damage, preventive measures may be required after the lapse of the mining rights, in other words, after the mine is abandoned.

In order to address this situation, the Director of the Mine Safety and Inspection Department Bureau is able to issue necessary remedy (installation) orders to the parties responsible for the damage during five years after the lapse of the mining rights (Article 26, Section 1). Parties receiving such orders shall be deemed the owner of mining rights to the extent necessary (Article 26, Section 2). This regulation is intended to ensure sufficient protection against damage caused by mines by making it possible to issue preventive orders to previous owners of the mining rights as well as to the parties in possession of the ownership at the time the mine operation was terminated, as long as such owners were responsible for the actions which resulted in damage.

Law on Special Measures for Mine Damages Caused by the Metal Mining Industry, etc.

Although policies aimed at the prevention of damage by metal mines were legally determined through the Mine Safety Law, problems beyond the scope of these policies surfaced in 1970. Human health was being endangered by heavy metals. This had not been evident previously due to a lack of scientific knowledge, but became obvious at that time and required immediate attention. Additionally, many sources of damage caused by mines have been accumulated through the long history of mining in Japan, and this problem also required resolution in the short term although responsible persons could not be identified for many of the sites. The provisions of the Mine Safety Law, which focused on operating mines, were insufficient for the resolution of the problems associated with accumulated damage due to heavy metal emissions from closed mines and for prevention of future damage. Special measures were needed for the prevention of damage on a semi-permanent basis after mines closed.

The Law on Special Measures for Mine Damages Caused by Metal Mining Industry etc. was adopted in May 1973 to address these needs. The main concept of the law was (1) to enable the remediation of damage from mines abandoned by the time the law was enforced (July 1973) by systematically implementing damage prevention activities (specifically, sealing pit mouths, land filling, and afforestation of deposits) according to "Basic plans", and (2) to enforce the setting aside of funds for remediating action that may be necessary in the future, when the mine is closed. These funds are to be reserved while the mine or deposition area is still operational. This Law made it possible to implement damage prevention activities systematically.

Amendment of the law on special measures for mine damage caused by metal mining industry, etc.

However, with the increasing number of closed metal mines, it is gradually becoming difficult to expect mining right owners, which may lack sufficient income, to maintain damage prevention activities. This situation is a serious obstacle for the financing and maintenance of implementation systems.

Amendments were therefore introduced into the Law on Special Measures for Mine Damages Caused by Metal Mining Industry, etc. (adopted May 1992, entering into force November 1992) in response to the resolution "Conception of Permanent Mine Waste Water Treatment Systems for Closed Mines" of the Mining Council from 3 February, 1992. These amendments enabled the establishment of funds to support permanent treatment of mine/waste water under the principle of the polluter's responsibility, and introduced a specific system to establish and maintain permanent means for mine waste water treatment.

The amendments included: (1) basic policies for mine damage prevention activities, and the expansion of the scope for mandatory submittal of mine damage prevention plans: (2) establishment of mine damage prevention activity funds, requiring the mining right owner to provide the reserves necessary to ensure the maintenance of permanent damage prevention activities for specific facilities (those closed facilities deemed to require positive and permanent treatment of mine waste water and specified as such by the Minister of International Trade and Industry) in accordance with the principle of the polluter's responsibility; (3) establishment of an organization designated by the Minister of International Trade and Industry for the prevention of specified mine damage, which shall implement preventive activities for specified facilities using interest on the aforementioned funds when mining right owners have made the designated payment of funds for the applicable facility.

MMAJ's Project for Prevention of Damage by Metal Mines

The Metal Mining Agency of Japan (MMAJ) is a non-profit agency established in 1963 and financed by the Japanese government. Since 1973, MMAJ has been responsible not only for such measures as are necessary for promoting the development of metal mineral resources, but also for measures relating to the prevention of mining-induced environmental pollution. The environmental pollution prevention measures to be undertaken by MMAJ can be broadly classified into the five categories described in the following.

Financing and guaranteeing loans

MMAJ finances operations to be undertaken by the relevant enterprises for damage prevention at disused mine tunnels and tailings or slag dumping sites. It also finances mine drainage processing projects, contributions to the Mine Damage Prevention Project Fund, and farmland soil addition and replacement projects under the provisions of the Public Nuisance Prevention Performing Expenses Liability Law. Finally, it guarantees the loans that enterprises concerned obtain from financial institutions for the difference between the funds required and the amount of loans extended by MMAJ.

Investigation and guidance for mine damage prevention projects and guidance and support

MMAJ undertakes investigation and guidance, including advance investigation or technical guidance, for mine damage prevention projects carried out by local governments at their request. It also provides guidance and support, including the planning and management of large-scale or technically difficult damage prevention projects, on commission from local governments. In addition, MMAJ has undertaken the management of large-scale and technically difficult processing facilities for mine drainage at the commission of local governments since 1982. MMAJ has also been collecting and managing information concerning the closure of mines since 1983.

Technological research and investigation

Various countermeasures are now being taken to prevent damage by metal mines. However, with regard to those mines from which mine drainage continues to be discharged even after they are shut down, there is a pressing need to develop techniques that allow drastic reductions in damage prevention expenses, since huge processing expenses will be required on a semi-permanent basis if conventional damage prevention techniques without any improvements are solely relied upon. MMAJ has been developing various techniques since 1975, including mine tunnel sealing techniques, stabilization techniques for discarded stone, tailings, or slag dumping sites, tree planting techniques, and mine drainage processing techniques, in order to promote effectiveness and economy in damage prevention projects. Currently, MMAJ is undertaking various studies concerning techniques for deep-well injection of mine drainage, labour-saving techniques for mine drainage treatment, and techniques for reducing damage prevention expenses, with the emphasis at present on reduction of the processing expenses of mine drainage.

Management of Mine Damage Prevention Project Fund

MMAJ manages the Mine Damage Prevention Project Fund which consists of funds deposited by the owners or lessees of mining rights for the purpose of assuring availability of funds for mine pollution prevention in mines closed in the future, under the Law on Special Measures for Mine Damages Caused by Metal Mining Industry, etc.

Business related to Mine Damage Prevention Project Fund

MMAJ undertakes the business related to the Mine Damage Prevention Project Fund, including collection of funds to be deposited, management of such funds, and issuance of payments as necessary.

Environmental enforcement for mining in Indonesia

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ENVIRONMENTAL LEGISLATION

The law constituting the cornerstone of environmental management and environmental protection in Indonesia is Law No. 4 1982. This law serves as a basis for the evaluation and adjustment of all legislation containing provisions related to aspects of the living environment. Included in the law is:

- The right of every individual to have a good and healthy environment and the obligation of every individual to maintain and protect the environment;

- The requirement for analyses of any environmental impact for every project that is considered likely to have a significant effect on the environment:

- The "polluter pays"principle:

- The authorization of a system of incentives, disincentives and licensing requirements to promote good environmental management: and

- Compensation for victims of environmental damage and pollution, and restoration of the environment.

Detailed regulations of Law No. 4 1982 are contained in Government Regulation No. 29 of 1986, which has been amended by Government Regulation No. 51 of 1993 aimed at regulating the procedures for Environmental Impact Analysis (EIA). Another regulation of importance to mining sector is Government Regulation No. 2 1990. Under this law, liquid waste can only be discharged into natural drainage after the permission of the governor of the affected region has been granted. Standards for effluents can be established by the Minister or, in some cases, by the governor concerned.

MINING LEGISLATION

Before Indonesian independence in 1945, mining activities were governed by colonial laws and regulations. One of the regulations was a safety regulation, the Mine Police Regulation issued in 1930. This regulation concentrates on safety matters, although it contains a few articles on the control of pollution. After laws and regulations had been amended several times, a basic mining law was promulgated in 1967. Article 30 of the Mining Law of 1967 states that "After completion of mining for minerals in any mine, the holder of the relevant mining authorization is obliged to restore the land in such condition so as not to evoke any danger of disease or any other hazards to the people living in the area surrounding the mine". The technical details of the laws are contained in Government Regulation No. 32 1969. Article 46, verse 4 of the Regulation states that "preventive measures shall be taken prior to mine closure so as not to endanger the environment"

The Decree No. 4 of 1977 of the Minister of Mines and Energy concerning the Prevention and Overcoming Damages and Pollution Caused by Mining Activities was the first specific regulation on environmental management. This was followed by the issuance of Decisions of the Directorate General of Mines Nos. 07.08.09/1978 concerning Prevention and Resolution Against Hindrances and Pollution Resulting from Operations of Open Pit Mines, Dredging Operations and Mineral Treatment.

ORGANISATION

The enforcement of health, safety and environment regulations is carried out by Mines Inspectors under the Directorate of Mines, where the Director of Mines also acts as Chief of Mines Inspectors. There are also Regional Mines Inspectors and District Mines Inspectors coordinated by the Chief of Mines Inspectors. Regional Mines Inspectors are responsible for inspection of mining activities in Regional Offices of the Department of Mine and Energy, while District Mines Inspectors are responsible for the inspection of industrial mineral mines. The latter inspectors are appointed by the Governor of the Regional Government as stipulated in Government Regulation No. 37 1986. At present, there are 12 Environmental Mines Inspectors within the Directorate of Mines and 61 Mines Inspectors in the Regional Offices of the Ministry of Mines and Energy. These inspectors conduct both environmental and occupational safety inspections. The number of inspectors is considered insufficient compared to the number of operating mines. The number of mines may increase because of the rapid development of the mining industry. Accordingly, the Government is currently developing policies and strategies to develop mine enforcement by appointing more inspectors, improving training and preparing new procedures.

RESULTS OF ENFORCEMENT

Some of the points raised by environmental enforcement are:

- Mine operators have an increased awareness of environmental management;
- Environmental impact assessments are important for environmental management;
- Mine reclamation is a major aspect of mine environmental management;
- Management and processing of mine waste need to be improved;
- Top soil management and disposal need to be improved;
- The area of land that has been reclaimed after mining is small compared to the existing mined-out area;
- Environmental monitoring has not been conducted properly;
- The frequency of water quality analysis is still limited and analyses are conducted only for some parameters, such as pH, turbidity, temperature, conductivity, dissolved oxygen and salinity. Analyses need to be conducted for heavy metals such as mercury, lead, copper etc which are thought to endanger the environment.

PROBLEMS AND CHALLENGES

Regulations

Regulations for mining activities need to be amended so that they are consistent with Law No. 4 1982 and Government Regulation No. 51 1993, thereby preventing ambiguity and misinterpretation.

Personnel

The Direktorat Teknik Pertambangan Umum (Directorate of Mines), a technical institution under the Directorate General of Mines, is responsible for developing and establishing technical guidelines which will improve the ability of personnel to control environmental impacts caused by mining activities in Indonesia. The insufficient number of technical staff and inspectors with knowledge and experience in the field of environmental management continues to be a major obstacle to the effective design of regulations and the implementation of policies.

Socio-cultural impacts

Socio-cultural impacts need to be better considered. Since mining is usually undertaken in remote and undeveloped areas, the role of indigenous people needs to be increased to cope with the impact mining development brings.

Companies' Commitment

In addition to the role of the Mines Inspectors and the regulations, the success of environmental management relies considerably on companies' commitment to the environment. The results of environmental enforcement so far indicate that companies' commitment to environmental management needs to be improved.

Policy and Regulatory Review

The Department of Mines and Energy is now reviewing and developing environmental policies and regulations for mines. This includes designing a comprehensive environmental policy and regulations with clear goals, responsibilities, actions and targets. Environmental threshold limit values need to be developed in cooperation with the Office of the State Minister for Living Environment (KLH) as well as other related Government Agencies. There should also be an assessment of the level of technology and the cost of applying the technology required to achieve a given standard, in order to not to jeopardise economic growth.

Training of personnel

To strengthen the capability of the Mines Inspectors to control the adverse effects of mining and mineral treatment in Indonesia, an extensive and comprehensive training programme needs to be conducted. This programme should also include "Training of Trainers", and an evaluation of the existing training programme for Mine Inspectors. Additional training of personnel in regulatory programme management, inspection procedures and use of modern equipment are also needed. Arrangements for Mine Inspectors to be trained abroad is another aspect that needs to be explored in order to provide inspectors with a broader knowledge and perspective of environmental enforcement and compliance in the mining industry.

Equipment

An assessment of necessary equipment and facilities to inspect, monitor, sample and analyze the physical and chemical properties of soil, water and air affected by mining operation is required. Opportunities for the provision of such equipment and facilities are sought.

Model Environmental Impact Management in the Mining Industry

The recently enacted Law No. 24 of 1992 concerning Spatial Zoning requires that land should be utilized to provide maximum benefits and welfare for the people. In addition to developing solutions aiming at minimizing land-use conflicts, mining operations also need to adopt the concept of multiple and sequential land use in their models of environmental impact management.

Summary of discussions

The situation as regards monitoring and enforcement varies widely among the countries in the region. In most countries, however, it is recognized that monitoring and enforcement by regulatory agencies is less effective than desired or envisaged in regulations. Shortages of adequately trained staff and equipment resulting from insufficiency of funds were seen as the main problems surrounding enforcement of environmental regulations for mining. It should be noted, however, that the shift of focus towards cooperation may reduce demands on the resources of regulatory bodies. There could also be scope for greater reliance on fees to finance monitoring and enforcement. However, as in the case of cost sharing for review of EIAs, this could raise the problem of financial dependence on operators. Training of regulatory agency staff should form an important element of public environmental policy in the area of monitoring and enforcement.

SESSION V: CONCLUSIONS AND RECOMMENDATIONS

Mineral resources development and the environment in the Asia/Pacific region

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INTRODUCTION

Mineral resources development has been identified as an integral component for economic progress in most of the developing countries of the Asia-Pacific region. Such development is dependent on the geological prospectivity and more recently on investment by the private sector. The development of the mineral sector has created a strong awareness of environmental degradation and most countries in the region are striving to adopt new laws and regulations on mining with environmental safeguards. Environmental protection is not new to mining codes and health and safety have been matters of regulatory concern for centuries.

This paper strives to review the impact of the mining industry on the environment and the present status of environmental regulations related to mining in selected countries of the Asia-Pacific region. Emphasis is also laid on training requirements in these countries so that such training can be effectively applied for future development of the mining industry, which will be heavily dependent on environmental considerations.

The 1992 "Earth Summit" at Rio de Janeiro focused attention on industrial activities in developing countries and on the interests and involvement of industrialized countries in such activities. In this regard, mining investment from industrialized countries in the developing countries of the Asian/Pacific region will have to take into consideration the effective environmental safeguards that are contained in national environmental policies of the developing countries. The present trend is to include such environmental regulations in mineral investment agreements and/or to bind the foreign entity to national laws and regulations aimed at environmental protection.

It is generally accepted that most developing countries of the Asian/Pacific region that are involved in mining operations lack the desired technology, experience and expertise to effectively formulate a national environmental policy with respect to mining. In order, *inter alia*, to activate such formulation the United Nations Department for Technical Cooperation for Development convened a Round Table Conference in June 1991 in Berlin which adopted a Plan of Action for mining and environment (the "Berlin Guidelines"). These guidelines were addressed to governments, mining companies and development assistance agencies. The guidelines were endorsed at a Seminar on Environmental Management and Mining for Mineral Resources Development convened by the ESCAP secretariat in September 1991 in Bangkok.

IMPACT OF MINING ON THE ENVIRONMENT

The location of mining facilities is subject to geological prospectivity and is not dependent on free choice or proximity of markets. Accordingly, large-scale mines are designed for specific sites and the environmental effects are governed by site-specific factors such as the *nature of the land*: plain, mountains, hills, location of rivers, access to sea; *climate*: rainy, arid; *transportation infrastructure*: rivers, roads, railways; *population*: dense settlement, relatively unpopulated, urban; *land-use*: agricultural, industrial, infrastructure settlements, water protection area, rainforest, pasture. The environmental effects of mining tend to increase both in geographical scope and intensity as exploration, extraction and metallurgical processing advance progressively.

The exploration phase, including mapping, geophysical and geochemical surveys and drilling, produces only minor environmental effects such as clearing of trees for drilling sites, camps, access roads, sinking of pits, holes and shafts, and can be handled by relatively simple rules ensuring that no lasting danger or damage remains.

The mining or extraction phase involves more intensive operations but the impact is localized. Subsidence is a well known problem of underground mining, specially coal mining. The environmental impact decreases with the distance from the mining source. However, modern large-volume low-grade mining uses only a very small percentage of mined ores. The disposal of overburden can cause major environmental problems such as sedimentation of rivers (which can extend to hundreds of kilometres) and the sea. Acid drainage from tailings dumps and the accidental overflow of water charged with poisonous chemicals, in particular cyanide used for leaching gold, can cause local, regional and in some cases cross-border pollution, leading to damage to the ecosystem and the human habitat. Sulphide ore, which constitutes a considerable amount of ores mined, can liberate large quantities of sulphur dioxide during processing. This produces sulphur trioxide in the atmosphere and sulphuric acid in water, contributing to acid rain and deterioration of cultural monuments. Some base metal ores also contain toxic substances such as cadmium, lead and mercury, and leachate from tailings can cause severe poisoning. Further, coal mining releases considerable amounts of methane, which is considered a major cause of greenhouse effects.

The main environmental degradation generated by the mining industry takes place at the metallurgical stage, mainly in smelting and refining. These industrial processes create air pollution by release of carbon monoxide and oxides of nitrogen and sulphur, water pollution through discharge of process water tailings and hazardous waste generated as residues in metallurgical processes. Mitigation of such environmental effects is possible through better process design, incorporation of anti-pollution devices such as filters and scrubbers and programmes to minimize and manage hazardous wastes. Anti-pollution devices used in metallurgy are identified as the largest element in environmental costs both in the form of capital investment and operational expenditure.

ENVIRONMENTAL REGULATIONS FOR MINING IN SELECTED COUNTRIES OF THE ASIA PACIFIC REGION

A review of the mining industry and associated environmental legislation was undertaken by the ESCAP secretariat in 1991 as a part of a UNDP funded regional project titled "Economic Restructuring and International Trade in the Mineral Commodities Sector" and six countries (India, Indonesia, Malaysia, Papua New Guinea, the Philippines and Thailand) were included in this study[1]. The study revealed that there is great environmental awareness in the ESCAP region and that future mining activities which involve conflicting uses of land and traditional mining practices will not be acceptable. Furthermore, socioeconomic, cultural and religious factors will have to be addressed more seriously. Land use conflicts between the mining industry and agriculture and other industries emerge as a major issue and in some cases constitute an impediment even at the early stages of mineral exploration and mine construction.

A summary on the status of environmental regulations related to mining in the selected countries of the region is provided in the following.

China

The Mineral Resources Law of the People's Republic of China promulgated in 1986 stipulates that "mining of mineral resources must comply with the relevant laws and regulations on environmental protection and measures must be taken to prevent environmental pollution".

The other laws and regulations that have been formulated and promulgated to protect and improve the human and ecological environments, prevent and control pollution and other environmental hazards, safeguard people's health and promote development of China's economic progress are:

- Environmental Protection Law of 1989;
- Law on the Prevention and Control of Air Pollution, 1987;
- Law on the Prevention and Control of Water Pollution, 1984;
- Regulations on the Prevention and Control of Noise Pollution 1989.

The question that arises is how the above laws and regulations could be effectively incorporated into a single law on environmental protection in the mining industry, including specific technological and administrative guidelines for effective implementation.

Although China has made good progress in environmental management in the mining industry, there is still a need for further refinements to statutory requirements to achieve accepted levels. Furthermore, China's environmental protection requirements for mining enterprises were enacted only in recent years and were not taken into consideration in social and economic development until the end of 1970s.

In China, the present investment by the state in environmental protection accounts for less than one percent of the national income[2]. According to a recent survey of 77 mines in the country, the investment in environmental protection accounted for only 0.89 to 3.25 per cent of the total investment. The "polluter pays" principle, perhaps with some subsidies from the state, will be effective in arresting environmental degradation. However, China's ability to manage the environment in relation to the mining industry is presently weak due to lack of technological know-how and financial resources.

India

Mining in India is regulated under the Mines and Minerals (Regulations and Development) Act, 1957, Mineral Concession Rules, 1960, and the Mineral Concession and Development Rules, 1988. The new National Mineral Policy, formulated and announced in March 1993, aims to encourage the inflow of private investment, both domestic and foreign, and technology transfer/refinement to improve productivity and efficiency and secure markets through international competitiveness. With a view to implement the new National Mineral Policy, the Mines and Minerals (Regulations and Development) Act of 1957 was amended in 1994 and was followed by consequential amendments to the relevant rules and regulations.

In addition there are four main environmental acts related to the control of the mining industry: the Water (Prevention and Control of Pollution) Act, 1974 (amended 1988), the Air (Prevention and Control of Pollution) Act 1981 (amended 1988), the Environmental (Protection) Act 1986 (with rules of 1986 and 1987) and the Forest (Conservation) Act 1980 (amended in 1988).

An application for a mining lease must contain an environmental management plan related to the mining plan and must be approved by the appropriate central government agency. The state government cannot issue a mining lease without this approval. The management plan should contain baseline information, an environmental impact statement and an environmental management plan.

Planned expansions of coal, lignite and limestone mining have raised major concerns regarding further degradation of forest areas and increasing competition for land. These concerns are the more serious since most of these expansions will be in the form of surface mines which will require more ambitious environmental management programmes.

The main issues related to expansion in the mining industry are potential damage to groundwater supplies and agricultural land, dust, management of top soil for proper storage and replacement of organic material after mining.

Competition for land and the pressure on population are major factors in the planned coal mining expansion. Many open-pit mines will be in areas of forest land and entails potential conflicts.

It is estimated that open-pit coal production will increase from the present level of 60 per cent of the total to 73 per cent within the next ten years[3]. Accordingly, rehabilitation plans for the effected land have been given high priority at all levels of government.

Indonesia

Law No.11 of 1967 on the basic provision of mining encouraged the active participation of foreign investors in the development of Indonesia's mineral resources through the provision for the Ministry of Mines and Energy to enter into contracts of work (COW). Since the signing of the first COW with Freeport Indonesia for the Ertsberg copper mine in 1967, more than 100 contracts have been signed for gold and other minerals, as well as 10 contracts for coal. In general, COWs can cover exploration, feasibility and construction and up to thirty years of production. The terms of the COWs are not specifically defined by statute and thus permits modifications to meet prevailing conditions.

Laws, regulations and decisions on environmental protection and management are based on the Constitution of 1945. In 1972, Indonesia instituted the State Committee for the Environment and in 1978, the Ministry of State for Development Supervision and Environment. In 1983, the Ministry was re-named Ministry of State for Population and Environment.

The Directorate of Mines was involved in compiling an inventory of sector policy related to the environment as far back as 1970. This attempt led to preliminary guidelines suggesting that the mining industry should take necessary action to minimize the effects of pollution and other adverse effects of mining operations on the environment.

The Environmental Management Act (1982) recognized the right of every person to a good and healthy environment. This Act also established the "polluter pays" principle whereby anyone who has caused pollution to the environment is liable to pay compensation.

Government regulation 29/1986 provided for the provision of environmental impact assessments for all industries including mining with effect from 5 June 1987. This regulation is supported by a ministerial degree containing general guidelines for implementation and procedures for the establishment of environmental impact assessment review commissions in various departments and provincial governments responsible for implementing the regulations.

A well established system of penalties and fines, ranging from closure through compensation to penal sanctions, is presently in operation. However, a shortage of technical skills in the area of environment and mineral resources management has caused problems in the implementation of the Environmental Management Act.

Since most mining operations are in provinces other than Java and located in sparsely populated parts of the country, there is less awareness of environmental degradation caused by mining in such areas.

Coal has been identified as a major source of energy for the 1990s and the growth in power generation from coal-fired power stations will continue to at least the year 2000. Major gold mine developments are taking place throughout the country, and although large operators are likely to protect the environment, the use of mercury in illegal small-scale mining causes chemical pollution of waters and fauna.

Malaysia

The environmental aspects of mining development are regulated under the Environmental Quality (Prescribed Activities) Environmental Impact Assessment Order, 1987, which is an amendment to the Environmental Quality Act 1974 (Act 127). Environmental impact assessments are required for the mining of an area exceeding 250 hectares.

The Department of Environment (DOE) within the Ministry of Science, Technology and Environment is the main agency administering the environmental impact assessment requirements. Under the new mining legislation which was scheduled for promulgation by Parliament in July 1994, an applicant for a mining lease must prepare a plan for environmental protection to be approved by the concerned state in consultation with DOE. The new legislation will place the responsibility for inspection of mining sites on the Department of Mines.

Mining of gold in Sarawak by illegal miners using mercury amalgamation has caused major environmental hazards. There is also concern for the protection of the shoreline ecosystem from the widespread mining of silica sand and heavy mineral sands containing ilmenite, rutile and zircon. Land use conflicts are also emerging due to increasing competition from other land users.

Philippines

The Philippines mining industry is administered under Presidential Decree No. 463 (the Mineral Resources Development Decree of 1974) which includes provisions for the safeguarding of the environment. Under the Bureau of Mines and Geosciences, a Mines Environment Control Section has been created and regional environmental implementation units have been established. The decree also included an administrative order to the mining industry to use its best efforts to safeguard the environment and the socioeconomic framework of the mine area.

Under the National Pollution Control Decree of 1976 (Presidential Decree 984) mining companies are required to provide data on waste disposal systems prior to project approval. Rules and regulations covering the administration of this Decree were published in 1978 and specify standards for air quality, water quality and noise pollution.

A review of the current mining code is aimed at assessing the overall policy for the mining sector and formulating an environmental policy for inclusion in the new mining code. The new code will replace the present lease system which provides a 25 year lease contract renewable for another 25 years. The mining industry is regulated by the Mines Branch which operates within the Department of Environment and Natural Resources (DENR). To obtain an environmental compliance certificate, which is mandatory before a mining lease is granted, a company must formulate an environmental guarantee plan. This plan permits environmental monitoring by community leaders, DENR and mining companies. To ensure that the communities have the necessary funds to carry out their obligations, trust funds have been set up using funds from the mining companies.

Present and future concerns are the opposition to current geothermal development, conflicts between small-scale mines and large companies, and gold mining by small-scale miners leading to mercury polluted water and tailings.

Papua New Guinea

The Mining Act of 1971 recognizes three scales of mining activity, ranging from small-scale mining on government land by the holders of a mining permit, through medium-scale mining under a gold mining lease or mineral lease, which is issued for a period of twenty-one years and is renewable, to large-scale capital intensive mining under a special mining lease which is issued for up to forty-two years.

Acts containing legislation on environmental matters with regard to mining activities include the Environmental Planning Act (1978), the Environmental Contaminants Act (1978), the Conservation Areas Act (1978), the Water Resources Act (1982, since revised) and the National Parks Act (1982). The Ok Tedi and Bougainville mines are regulated by separate contractual agreements. The responsibility for environmental matters lies with the Department of Environment and Conservation (DEC) under the Environmental Planning Act. Before a mining license is issued an environmental plan must be included as part of the feasibility study. The major concerns relating to large-scale mining activity are the disposal of tailings and sedimentation of major rivers.

Thailand

Minerals are owned by the State, and exploration and development are controlled by three main acts: the Minerals Act of 1967 (amended in 1973 and 1979), the Mineral Royalty Rates Act of 1966 (amended in 1977 and 1979) and the Tin Control Act of 1971. The legislation is administered by the Department of Mineral Resources (DMR) within the Ministry of Industry.

The main environmental acts having a direct impact on the mining industry are the National Reserved Forest Act of 1964, administered by the Ministry of Agriculture and Cooperatives, and the National Environmental Quality Act of 1975 (amended in 1978), administered by the National Environment Board.

A mining concession lease is required before mining takes place and an environmental impact assessment must be presented along with the lease application to the DMR. This report must include procedures for prospecting and the rehabilitation of the mining area. After initial examination by the DMR Environmental Division, DMR will submit the report to the Office of the National Environment Board for approval if there are no serious omissions or inconsistencies.

The drastic reduction in tin mining operations in Thailand has been more than compensated for by the mining of gemstones and gold coupled with a major increase in the production of industrial minerals.

It would appear that the single issue of importance that constrains the development of the mining industry is that related to forests. Studies have shown that less than one per cent of the total land area of Thailand has been allocated for mining activity and that 98 per cent of pending mining applications are located in national forest reserves. Rapid deforestation over the past thirty years and increasing environmental awareness have led to a nationwide ban on logging and the closure of forest reserves (40 per cent of the total area of the country) to all extractive industries including mining.

TRAINING REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT

The study carried out by the ESCAP secretariat in the countries mentioned revealed that there is a need for training in various aspects of environmental management, especially for government officials responsible in such activity. There is also a need to educate the people living in environmentally sensitive areas on the hazards of carrying out unsystematic mining operations.

The majority of government officials in most of the developing countries of the region need training in environmental monitoring techniques, the enforcement of environmental legislation and arbitration and negotiation. The following areas have been identified as priorities for training in the region :

- Evaluation of Environmental Impact Assessments;

- Monitoring/sampling techniques;

- Education of small miners in hazards related to unsystematic mining and in the use of toxic chemicals;

- Collaboration and effective networking between various government agencies and the private sector in implementation of various regulatory measures;

- Effective methods of combating acid discharges from coal and lignite mining;

- Dissemination of information on evaluation of mining-related environmental technology, its cost effectiveness and adaptability to the region.

CONCLUSIONS

This paper has outlined the status of environmental management in selected countries of the Asian/Pacific region and immediate requirements for further training.

Environmental policies for mining in the developing countries of the region have been expressed in mining codes and their subsidiary regulations as well as in mineral investment agreements. These mining codes and agreements contain generally formulated provisions related to the minimization of environmental degradation and the mandatory submission of an environmental impact assessment as part of the feasibility study which is usually the basis for the mining right. Provisions for the reclamation of mined-out areas are often open-ended and not specific. This could lead to disregard of basic environmental management. However, historical evidence indicates that such open-ended formulations are only the first phase of environmental concerns, and that, eventually, mining laws and agreements with more specific regulations and environmental obligations are developed.

One question is whether environmental issues should be dealt with by the mining authority or by an environmental agency focusing on environmental degradation related to mining activity. Another question is whether the mining law or a separate environmental code should be the prime source for environmental regulations. Both the minerals promotion agencies and the environmental protection agencies have specific roles, but both must be involved in the process leading to a properly conditioned mining license. The mining agency should be the promoter and the "lead" agency while the environmental authority should take the lead on environmental issues.

In conclusion, it could be stated that environmental issues have not historically been a concern to the miner. Moreover, the industry is perceived to cause environmental damage and there is a general misconception among the public that the industry resists any change. However, since the adoption of Agenda 21, the mining and metals industry takes pollution of the environment very seriously and places a high priority on environmental management in developing countries of the region. However, there should be a balance between the need to conserve the environment and the need to fuel the world's major industries through the supply of industrial minerals and metals. In this context, it is important that the public be educated on the role of metals in daily life.

Notes

1. See Report prepared by Nolan, Davis and Associates Ltd. of Canada, in "Mineral Resource Development and the Environment" ESCAP, Publication ST/ESCAP/1192 (1992).

2. See Environmental Management for the Mining Industry in China by Kong Fanchang in ibid.

3. Training Requirements in Environmental Management Relating to Mineral Resources Development in the ESCAP region: Report prepared by consultants Nolan, Davis and Associates Ltd., of Canada.

Summary of discussions

It was agreed that technical assistance by international organizations, including in particular UNCTAD and ESCAP, to countries in the region should focus on advice and assistance to countries that are in the process of introducing or reviewing legislation and environmental regulations for mining. Priority should be given to countries that have less experience in these areas.

Training of government officials responsible for reviewing environmental impact assessments should have a high priority both in nationally financed government programmes and programmes financed by international agencies. Governments should designate this as one of the priority areas in their national programmes submitted to the UNDP for financing. Where possible, the training should take place in the home country rather than abroad, although lack of necessary equipment and training materials might necessitate training in other countries.

National programmes should include as one element the increased involvement of non-governmental organizations as consultative participants in the policy making process.

Participants in the seminar would constitute the nucleus of an informal network on environmental management and regulation of mining. UNCTAD would attempt to ensure that the participants are continually informed of developments and that their advice is solicited on an informal basis.

ANNEX
List of participants

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	Machfuddin, Environmental Analyst, PT Aneka Tambang
	Ridwan Mahmud, Ministry of Mines and Energy
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Rasyida. Environmental Engineer. PT Elnusa

Prasetyo B. Saksono. Senior Staff. PT Timah

Selinawati. MTDRC

Boni BSN Siahaan. Directorate of Coal. DGM. MME

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Widartoyo. Mining Engineer. Indonesian Mining Association

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